UNITED STATES BANKRUPTCY COURT
FOR THE WESTERN DISTRICT OF NORTH CAROLINA
CHARLOTTE DIVISION

IN RE:	)	
	)	
GARLOCK SEALING TECHNOLOGIES LLC, et al,	)	No. 10-BK-31607
	)	
Debtors.	)	VOLUME VII-A
	)	MORNING SESSION

TRANSCRIPT OF ESTIMATION TRIAL
BEFORE THE HONORABLE GEORGE R. HODGES
UNITED STATES BANKRUPTCY JUDGE
JULY 30, 2013

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I N D E X

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E X H I B I T S

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P R O C E E D I N G S

JULY 30, 2013, COURT CALLED TO ORDER 9:30 A.M.:

MORNING SESSION:

THE COURT: Good morning. Have a seat.

MR. FINCH: Your Honor, Mr. Frost will present our next witness, but Mr. Guy wants to present a matter to the court.

THE COURT: All right.

MR. GUY: At the beginning of the case there was agreement to provide demonstratives before they were used. I understand that we changed that process and that's fine. But if we could get the demonstratives after they've been used by hard copy, pdf, from both sides, that would be helpful to us. We're trying to evaluate the merits on both sides here. We've raised this issue twice. I don't think there's a disagreement, we just haven't received any yet.

So what I would propose is that at the end of the day, after demonstratives have been used, the slides that you're seeing, that we're seeing, the hard copy be pdf, whoever happens to be presenting those slides.

THE COURT: Is that all right with you all?

MR. FINCH: Fine with me.

MR. HARRIS: Like I said, we haven't done that yet so far.

MR. GUY: We can catch up pretty easily, Your Honor.

This is only the documents that the court's seen.

THE COURT: Once they've been used, we ought to do that, seems to me.

MR. HARRIS: Yes, Your Honor.

THE COURT: Is that all right?

MR. HARRIS: Yes, sir.

THE COURT: Okay.

MR. GUY: Your Honor, and we watched the video, most impressive your mother would let you do that.

THE COURT: I'm just glad I wasn't in England. I mean on the side that dropped off a thousand feet on the other side of that little wall.

MR. GUY: Shouldn't definitely do it in Italy, Your Honor.

MR. FROST: Good morning, Your Honor. Our next witness is Mr. John Templin.

PHILIP JOHN TEMPLIN,

Being first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. FROST:

Q. Mr. Templin, could you state and spell your name?

A. Certainly. My full name is Philip John Templin. Philip is P-H-I-L-I-P. John is J-O-H-N. And Templin is T-E-M-P-L-I-N.

Q. And Mr. Templin, what do you do for a living?

A. I'm an industrial hygienist, sir.
Q. Now, we've heard a lot about industrial hygiene, so we're going to cut to the chase a little bit with what we're going to talk about today. But do you agree to keep all of your opinions that you're going to give today within a reasonable degree of scientific certainty?
A. Yes, sir, I do.
Q. Now, industrial hygiene, I want to talk about industrial hygiene as it relates to asbestos and sort of go there, and then we'll talk a little bit about that as it relates particularly to asbestos.

But could you just briefly give us your training, background, and experience that led to you being a certified industrial hygienist?
A. Certainly, I'll be glad to. I have a Bachelor of Science degree in biochemistry from the University of Pittsburgh awarded in 1976. I went on to the graduate school of Public Health at the University of Pittsburgh and received a Master of Science degree in 1980. From there I went to work at University of Houston on what was called a New Directions Grant, a program administered and funded by federal OSHA. From there I went to California and joined CAL-OSHA'S consultation service. And it was during my tenure with CAL-OSHA that I sat for and passed the certification exam to become a certified industrial hygienist.

Q. Now CAL-OSHA, what is CAL-OSHA?
A. CAL-OSHA is a program that was set up under one of the provisions of the Occupational and Safety and Health Act of 1970, which said that individual states, if they so chose and if they had the wherewithal could establish their own state plan, as they were called, OSHA programs.

Those programs had to be at least as stringent, at least as effective as their federal counterpart, and the state programs are subject to ongoing federal oversight to ensure that that remains so.
Q. And because of that work, have you become familiar with the OSHA regulations as they relate to asbestos?
A. Yes, sir, I have.
Q. Now, you're a certified industrial hygienist. When were you certified and what did it take -- does it take to become a certified industrial hygienist?
A. I became certified in 1985. The process really entails a number of things, one being experience. With a Master's degree, at least at that time, you needed a minimum of four years' experience before you could sit for the examination.

Proper education, which for industrial hygiene could be a degree specifically in the field, or it could be a degree in a physical or a natural science, chemical engineering for instance, biochemistry, physics, potentially would qualify.

Once one has accumulated that, then you have to make an

application to the American Board of Industrial Hygiene, which is our governing body. And it's much like applying to a professional school. You have to do everything including furnish references from people who already are certificated industrial hygienists, attesting not only to your competency, but also to your ethical fitness, since you are going to be entrusted, potentially, with overseeing health and safety programs for possibly thousands of people.

Q. And has asbestos been an area of interest for you as a certified industrial hygienist?

A. A certified industrial hygienist, and really going all the way back to the very first few weeks of graduate school. That was a topic that was discussed at great length, and continued to be such throughout my professional career.

Q. Have you given any presentations concerning asbestos?

A. Yes, sir, I've given many -- many such presentations.

Q. What about professional writings. Have you written anything on asbestos?

A. I've written a few things, but in terms of what's been in the published literature -- let's say the peer-reviewed published literature, I've not been a prolific author, I would say.

Q. Okay. Have you written chapters and definitions of asbestos in the past?

A. No, sir, I've not done that.

Q. Now, there was some discussion, I think with Mr. Boelter about a letter that Dr. Longo and yourself wrote in response to some of his studies. Is that something that you commented on in the past?
A. Yes, sir, it is.
Q. Now, you testified in asbestos cases in the tort system, correct?
A. Yes, sir, I do so.
Q. And how much do you get paid to testify, say in this case?
A. I don't get any direct compensation based on testifying in a case like this. My employer gets reimbursed for my time at a rate for testimony of $350 an hour.
Q. Okay. So your rate -- and your employer is MAS, Dr. Longo's company?
A. Yes, sir, that's correct.
Q. So you don't get it, but MAS charges you out at $350 an hour?
A. That's correct.
Q. And do you have a ballpark figure of how many hours, or how much MAS has billed for your time in this case?
A. I would say to date, somewhere in the neighborhood of 40- to $45,000.
Q. Not millions of dollars?
A. Not even close, no, sir.

Q. Now let's get to the heart of your testimony, Mr. Templin. In regards to industrial hygiene and asbestos, when did -- when -- how long has this field of industrial hygiene been around?
A. The term industrial hygiene, at least to my knowledge, was first applied to the practice back in 1914. So it's been around for a long time.
Q. And we talked to Dr. Longo and Mr. Boelter a lot about air monitoring, and different types of air monitoring that you could do. How long has this idea that you could monitor people while they're doing work practices, or while they're in a factory, to see if they're being exposed to toxins? How long has this idea of air monitoring been around in industrial hygiene?
A. That I'm aware of, at least since the 1930s.
Q. Now in the 1930s, what's one of the seminal points in regarding industrial hygiene concerning knowledge of the dangers of asbestos?
A. I would say that would be -- the publication of what's known as the Merewether and Price Study, that came out in 1930 and discussed in great detail the hazards of asbestos and the control measures that should be implemented to reduce exposures to asbestos and thereby reduce the hazard associated with it.
MR. HARRIS: Excuse me for a second.

Your Honor, as with Dr. Longo, we have filed a *Daubert* challenge with respect to Mr. Templin. He's about to get into his opinions and testimony. We just ask that the court carry our motion or reserve ruling on our motion until its had an opportunity to hear his testimony and consider our *Daubert* motion.

THE COURT: All right. That's what we'll do.

MR. FROST: Then Your Honor, I guess I'll go ahead and offer Mr. Templin as an expert in industrial hygiene at this point so the record's clear.

THE COURT: Okay.

MR. HARRIS: I don't object to his testimony as an industrial hygienist, Your Honor, but it's beyond the scope to which we make an objection to his qualifications, and as we've explained in our *Daubert* motion.

THE COURT: All right. We'll accept him as an expert in industrial hygiene.

BY MR. FROST:

Q. Okay. Mr. Templin, we were talking about the Merewether Price study in the 1930s. Where was that published and can you just briefly outline what we knew about the dangers of asbestos based on that Merewether and Price article?

A. That was a publication that actually was commissioned by the government in the United Kingdom. Dr. Merewether and Mr. Price were a physician and engineer respectively with the

Health and Safety Inspector in Great Britain at that time, and they were commissioned to do a study on uses of asbestos, dust-producing operations that involved asbestos, and how to control those operations.

That again, as I said initially appeared in 1930. It's appeared in different forms, and in different countries in the years following that.

Q. Now when Merewether and Price published this, what industry were they dealing with?

A. They were dealing really with -- in fact the report is actually in two parts. Part one really deals with the textile industry. Part two deals with all the industries that were utilizing asbestos at the time that they did their report, which was quite a number of them.

Q. And the asbestos textile industry, what fiber type were they predominantly using in England at that time?

A. Chrysotile, sir.

Q. So that 1930 article by Merewether and Price was dealing with analysis of asbestos textiles in England using chrysotile asbestos?

A. Yes, sir, that's correct.

Q. Now, they had two sections of the report, we'll talk about the second section in a little bit.

But the first section, did they talk about how you can protect workers from the dangers of asbestos in that 1930

report?
A. Yes, sir, they did.
Q. And what did Merewether and Price, what did we learn from them in 1930 about protecting workers from chrysotile asbestos?
A. They recommended in that report that dust-producing operations be enclosed or physically separated from the personnel elsewhere in the plant. That the materials be worked with wet, to keep the -- or to suppress dust, prevent dust from being released. That stringent cleanliness measures be taken within the work place. That the employees working with the product, as a last line of defense, they recommended be provided with very protective respiratory gear, which in their opinion consisted of supplied air respirators, or what we use today called supplied air respirators.

Last but not least they recommended what they termed education of the worker to what they termed the saying, the appreciation of the risk.

Which in my experience has been extremely important, because without that understanding, then following through with some of these control measures, it sometimes is either haphazard or just doesn't occur at all.
Q. Now, as we sit here today, we have a slide entitled, "Safety Engineering Protected Rules for Asbestos." And it goes through, design the hazard out, eliminate the asbestos.

Is that something that Merewether and Price talked about also?
A. They did not directly address eliminating asbestos in that report, but they certainly did, by virtue of the work practice and engineering controls that they recommended, go about trying to design the hazard out.
Q. Then the second slide says, guard or block access to asbestos. It has an individual taking some material out in an HVAC suit. Is that something today we still try to do if we have anybody getting close to asbestos?
A. Yes, absolutely.
Q. And then the last is provide fully adequate warnings about asbestos hazards. Is that saying, appreciation of the risks?
A. Yes, sir, it certainly is.
Q. Is there anything besides -- we've learned some new different techniques, some different ways to monitor asbestos, maybe some new microscopes that analyze very small particles. But is there anything about the basic industrial hygiene, the design the hazard out, guard, block, fully inform the workers, is there anything that's really changed, fundamentally, since 1930 to today?
A. No, sir, there isn't.
Q. And in that 19 -- in the Merewether report and the further reports that they had in the 1930s, did they actually

talk about asbestos packings and those types of materials like gaskets being a problem?
A. Yes, sir, they did.
Q. Was that in the second phase of the reporting that they did?
A. Correct, it was.
Q. And we have up on the chart a quote "industries and process in which asbestosis occurs." When they're talking about asbestosis, we're still talking about chrysotile at that point, correct?
A. Yes, sir, we are.
Q. And it says, "Processes involving exposure to asbestos dust, which are known to give rise to asbestosis, or in which the conditions are such as to be liable to produce the disease are:"

And they list, "the sawing, grinding, and turning in the dry state of articles composed wholly or partly of asbestos such as" and there's a list of them, but we have "packings and jointings" highlighted.

Is that what was known in the 1930s about the dangers of chrysotile asbestos and packings and jointings?
A. Yes, sir, that's correct.
Q. Now Mr. Templin, have you also reviewed some documents that indicate what knowledge folks like Garlock may have had in the 1950s concerning the dangers of asbestos?

A. Yes, sir, I have.
Q. And what have you reviewed, just in general?
A. Just in general, I've reviewed Garlock's responses to interrogatories which sort of traced the history of their use of asbestos in packings and gaskets, their membership in various trade associations such as the American Textile Institute, and participation in the meetings of those various organizations.
Q. And the American Textile Institute, what generally is that, some type of trade organization?
A. We consider it a combination of trade and professional organization for people who used asbestos as part of textiles. And textiles, historically, would have included woven brake lines, packings, gaskets, things of that nature.
Q. So when we talk about the textile industry, that involves people that are making packing and gasket type material also?
A. Yes, sir, it does.
Q. Okay. Because sometimes we think about textiles, we think about like suits and things. That's not the way it is with these things?
A. Industrially, no.
Q. Now we have up there on the slide which is ACC 3312. A minute of the meeting of the Board of Governors of the Asbestos Textile Institute. And that's one of the organizations that Garlock was a member of, correct?

A. Yes, sir, that's correct.
Q. And this one's dated March 7 of 1976 in Philadelphia. It says "Dr. Smith addressed the meeting first with remarks directing attention to a report issued by Dr. Hueper, titled 'Public Health Monograph No. 36, A Quest Into the Environmental Cause of Cancer of the Lung'."
Then further on in the document it says, "Dr. Smith strongly recommended that the institute, institute a program of investigation and publicity to counteract the unfavorable publicity presently directed to the asbestos industry as a result of the work of Dr. Hueper."
Is that one of the documents you reviewed?
A. Yes, sir, it is.
Q. In fact, prior to 1956, in 1942, Dr. Hueper had -- well, Dr. Hueper had published a book called "Occupational Medicine" in around 1942 where he raised the issue of asbestos and cancer of the lung, correct?
A. Yes, sir.
Q. And so this is, I guess, what, 14 years later that Dr. Hueper's still dealing with this issue of asbestos in the textile industry?
A. That's correct.
Q. Okay. Now, in 1957, this is ACC 3313. Is this another one of the memorandums that you were looking at and reviewed?
A. Yes, sir, it is.

Q. Okay. Says, "The first item for discussion was the memorandum of proposed epidemiological study of lung cancer in asbestos workers for the asbestos textile institute."

So, Mr. Templin, as far as the ATI is concerned, when we talk about asbestos workers, that includes people that are working in the asbestos textile industry, such as people that would work with manufacturing Garlock gaskets, correct?

MR. HARRIS: Objection, Your Honor, to the extent he's asking Mr. Templin to interpret a document.

THE COURT: Sustained to that extent.

BY MR. FROST:

Q. Do you have an understanding whether people who are working in the asbestos textile industry manufacturing textiles, would those be considered asbestos workers, Mr. Templin?

A. Yes, sir, they would.

Q. Okay. Now section two says, "There's a feeling among certain members that such an investigation would stir up a hornet's nest, and put the whole industry under suspicion."

Then the third says, "We do not believe there's enough evidence of cancer or asbestosis or cancer and asbestosis in this industry to warrant this survey."

That's what the document indicates was what was known in 1957 by the asbestos textile industry, correct?

A. Correct.

Q. Now prior to this document in 1957, had there been in the 1930s and in the 1940s, either reports or other things that talk about people in the textile industry that are getting asbestosis and cancers of the lung?
A. Yes, sir, there have.
Q. And why is it important that even prior to 1957 we have these types of things happening, and these individuals who are actually working or manufacturing these products?
A. It's important to understand that industry was well aware, as far back as the 1920s about the hazard of asbestosis. Reports began emerging about 1935 of people with asbestosis also developing lung cancer. That case was effectively revisited by Sir Richard Doll in 1955. And he went back and reviewed the cases discussed in 1935, and the cases that had occurred since then, and concluded definitively, that there was a cause and effect relationship between asbestos exposure and lung cancer.

MR. HARRIS: Your Honor, I guess I need to make an objection here to the extent that there's some suggestion that this document from 1957 reflects minutes of meetings that Garlock attended.

Garlock wasn't a member of the ATI during this time, the attendance indicates that it wasn't there. It did attend a meeting in the '50s, I think just one meeting in, I believe, 1956 as a guest. But this is not an organization to which

Garlock was a member. I object to the extent there's any suggestion that Garlock had these minutes, received this type of information at the time.

THE COURT: All right. We'll let him proceed.

BY MR. FROST:

Q. Mr. Templin, have you reviewed Garlock's interrogatory answers that indicates they were members of the ATI?

A. Yes, sir, I've done so.

Q. Okay. And in fact, in the next document that we have, and Mr. Harris may have gotten a little ahead of us, is from 1956 is ACC 3312. And in fact Mr. -- Dr. Houghton, H-O-U-G-H-T-O-N from the Garlock Packing Company was in attendance for sure, correct?

A. Yes, sir, that's correct.

Q. Okay. Now let's go back. Because prior to this meeting in 1956, Dr. Doll had published in the literature his conclusion that asbestos causes lung cancer as an epidemiological study, correct?

A. Yes, sir, that's correct.

Q. So as of 1955, is there any doubt that exposure to asbestos in the textile industry could cause asbestosis or lung cancer?

A. No, sir.

Q. Okay. So let's look at ACC 3312. It says, "No. 1, Asbestosis and cancer, a discussion relative to compensation.

Dr. Kenneth Smith, medical director of Johns-Manville Corp., requested to be present at this meeting because of the recent developments in the compensation field regarding asbestosis and cancer. Dr. Smith informed us that in his opinion, we have an epidemic of lung cancer in the world today."

Then it goes on to talk about Dr. Hueper's claim that "asbestosis cancer can be found after exposure of six months to 42 years in ages of people from 25 to 65 years."

Was that what was known in the 1950s concerning the different types of exposure to asbestos that could cause disease?

A. Yes, sir. At least to the extent that Dr. Hueper and others studying the issue had come to their conclusions.

Q. And again, Dr. Hueper had published before that about asbestos causing cancer, then Dr. Doll proved it definitively. And then in the 1950s there's discussions in this internal document about the compensation claims that were being filed. Is that what you understand?

A. Yes, sir, that's the chronology.

Q. The next document is ACC 3315. This is from 1969?

MR. HARRIS: Excuse me, Your Honor. If we could just go back to that prior slide. I object to the extent they've represented that Garlock actually sent a doctor to that meeting, it was Mr. Houghton, not Dr. Houghton.

THE COURT: Okay.

BY MR. FROST:
Q. ACC 3315. This is a minute from the Board of Governors of the Asbestos Textile Industry from October 9 of 1969. Is this another document, Mr. Templin, that you reviewed?
A. Yes, it is.
Q. Okay. And it says "Confidential information is that the USPH Service --" What's the USPH Service?
A. United States Public Health Service, sir.
Q. Is that part of the United States government?
A. Yes, sir, it is.
Q. "Confidential information is that the USPH Service is preparing a position paper on the health aspects of asbestos. And Mr. Scheckler has reviewed a draft of same. The USPH gives the opinion that asbestos hazard can be controlled except for mesothelioma."
Now, this is in 1969, correct, Mr. Templin?
A. Yes, sir, that's correct.
Q. And prior to 1969 had there been discussions and studies concerning mesothelioma that have been published prior to this?
A. Yes, there had been.
Q. And was there any discussion about whether there was any safe level, say at Dr. Selikoff's conference in 1964 where people from industry discussed whether there was a safe level of exposure to asbestos?

A. There were such discussions, and the consensus was, there was no safe level of exposure vis-a-vis the risk of developing mesothelioma.
Q. And so that's at least five years prior to all of this?
A. Yes, sir, that's correct.
Q. And that's why the United States Public Health Service in 1969 would be saying the hazard might be controlled except for mesothelioma?
A. Yes, sir, that's correct.
Q. And then this document continues to go on, "Mr. Scheckler raised the question of whether it would be desirable to have Dr. Selikoff as the guest speaker at an ATI meeting. Mr. Rainy felt we should defer it as timing was not right. It was the consensus of the board that any invitation to Dr. Selikoff should be deferred. Also that if and when, invited to speak, that Dr. Selikoff agree there be no publicity released in connection with his talk at the institute meeting."
Is that your understanding of what the ATI was discussing in 1969?
A. Yes, sir, it is.
Q. And at that same time was Dr. Selikoff going around the country publicizing the fact that asbestos was causing problems in multiple industries?
A. Yes, sir, he was doing so.

Q. The last one I believe is ACC 3315.

MR. FROST: No, it's actually -- apologize, Your Honor. I want to make sure I have the right numbers.

Okay. That's the correct number so the record is correct. It's ACC 1002.

This is another minute of the meeting of the Asbestos Textile Institute from February 11 of 1966, and again individuals from Garlock are listed as being present during this, correct?

A. Yes, sir, that's correct.

Q. Okay. Now this document talks about publicity and what's being known in '66 about the dangers of asbestos, correct?

A. Yes, it is.

Q. Okay. And it says "more and more publicity is being given to the health hazards in working with asbestos. The latest clipping of the National Observer of 2766, written by John Henderson, MD, discussed some symptoms of asbestosis and stated that the incidence of asbestosis is rising, and that 30 years from now it will be much higher."

The article stated that "doctors are mystified by the appearance of a rare tissue tumor, mesothelioma, which is found increasingly in asbestosis victims."

Now, I guess I should have had this one earlier, but this confirms that at least as of 1966, individuals such as Garlock and members of the Asbestos Textile Institute would be aware

of mesothelioma as a cancer caused by asbestos?
A. Yes, sir, it would.
Q. And why is that significant, Mr. Templin?
A. As it says here, mesothelioma is regarded as a sentinel tumor, something that is caused almost exclusively by exposure to asbestos. It has an extremely long latency period, which means it can take at a minimum of 10 years to develop, it can take anywhere from 30 to 50 years to develop, and it's invariably fatal. There is no -- really no effective treatments. There are palliative treatments --

MR. HARRIS: Your Honor, I object. This is way outside his area of expertise.

THE COURT: I agree. Go on to something else.

BY MR. FROST:
Q. Just as a industrial hygienist, why is it significant that as of 1966, a tumor such as mesothelioma is being recognized as being a problem involving the textile industry, which Garlock was a member of?
A. Because it brings that issue to the attention of the industry, and it's something as I've indicated, that's an extremely serious industrial hygiene concern, and one for which effective controls could readily have been implemented.
Q. And those were what we talked about at the beginning of your exam?
A. Yes, that's correct.

Q. Now let's talk about asbestos. We've heard a lot about different numbers concerning asbestos, and so I want to sort of put those into the context of industrial hygiene.

Have you looked at this issue of ambient exposures, and how much exposures an individual would have to asbestos at ambient levels?

I guess we'll define ambient, first.

A. Sure. Ambient means what is existing in the air -- the outdoor air of a given locale during specific time periods.

Q. Now you came up with an analysis of an individual that was exposed to asbestos at ambient levels, and I put that analysis up on the board.

Can you start out with explaining to us if we have an adult human being, how much cubic meters of air do they normally breathe in a 24-hour period?

A. In a 24-hour day, a healthy adult will breathe about 20 cubic meters or inhale, I should say, 20 cubic meters of air.

Q. Okay. And that's what we have up there at the top?

A. Yes, sir, that's correct.

Q. Okay. And what -- how much, when we talk about ambient concentrations of asbestos, how much do you calculate that to be when we deal with cubic meters of air?

A. In a per cubic meter of air measure, that's about 50 asbestos fibers for every cubic meter of air.

Q. Okay. That's what we have as the second line up there?

A. Yes, sir, that's correct.
Q. Okay. And can you explain what the rest of the analysis is that you've done?
A. Certainly. Basically just multiple 20 by 50. In other words, the amount of air that a person inhales in a typical day of 20 cubic meters, times the amount or number of asbestos fibers in each cubic meter of 50, and you have 1,000 asbestos fibers inhaled per day. In a 365-day year, of course that works out to 365,000. And somebody who's reached the age of 70, which until fairly recently was a reasonable average life expectancy in the United States during that period of time, 70 times 365,000 yields a product of 25,550,000 asbestos fibers inhaled during that span.
Q. So it's an individual when they reach the age of 70 using these numbers, that's the amount of asbestos fibers they would have breathed in the ambient air without ever doing any work involving asbestos, this is just folks that are living in the United States?
A. Assuming they're living in an urban environment, yes. That's where the data came from.
Q. Okay. And then what do you try to do with the next set of numbers? How are you comparing those things, and what are you comparing?
A. Basically, what we're taking -- what I've done here is take the very low end of exposures from gaskets and packing,

which happen to do with packing material, roughly 0.01 fibers per cc.

Since there are a million cubic centimeters in a cubic meter, that works out to 10,000 asbestos fibers in a cubic meter. Which as we indicate here is 200 times greater than the value that I've employed in the prior calculation for ambient.

Q. And so this is -- this number, this .01 fibers per cc, that's not for grinding on gaskets, that's just working with and removing packing material that's in a valve, correct?

A. It's actually the low end of the range, I believe from the cutting of packing.

Q. So that's not any grinding or anything like that, that's just manipulating asbestos material?

A. Correct.

Q. Okay. Then what's the rest of the chart show us?

A. Basically that's just working through a progression to illustrate how long it would take at increasing exposure levels, all of which of course are readily encompassed by the ranges that we have seen, both in my report and of course during Dr. Longo's testimony yesterday.

At .1 fibers per cc, a person would need to be exposed to roughly 25.5 -- not sure that's correct. I would have to look at the report again. It's either 255 days or 25.5 days. We may have to back that one up.

The last part I know is correct.

MR. HARRIS: Your Honor, we object to this line of questioning. This isn't something that appears in any peer-reviewed scientific literature. He seems to be unsure of what the numbers are and the calculations that were made. So we object to him providing this type of information to the court.

THE COURT: We'll let him proceed.

MR. FROST: Your Honor, it's in this report. It's at page -- pages aren't numbered, but it's in paragraph two. It looks like, Mr. Templin, I made a mistake, it should be 255.5 days. So let's -- Your Honor, may I approach and hand him his report?

THE COURT: Yes.

THE WITNESS: I thought that was what the answer was. I'm sorry, sir.

BY MR. FROST:

Q. That's okay. So let's just correct the chart while we're looking at it. So that should be 255 days?

A. 255.5, to get it precise.

Q. Okay.

A. -- actually, sir, let -- actually let me correct myself. You did have it right on the chart. At .01 it would 255 days.

Q. Let's just add that one line real quick so everybody will be happy. It's 255 -- okay. There we go. Is that --

A. Now, we have it.
Q. Okay. So, basically all I did was I added one line, which was 255.5 days of exposure at 0.01 fibers per cc. That's the packing exposure number, correct?
A. Yes, sir, that's correct.
Q. Then the other calculation that I did was at 0.1 fibers per cc. What is the significance of 0.1 fibers per cc concerning asbestos?
A. 0.1 fibers per cc is something would be -- we've seen pretty routinely in terms of removing and installing packing. It would be towards the low end of the range that one would see when fabricating gaskets, and at the very low end of the range for removal of gaskets.
Q. Okay. So we're at the low range of removal at .1 fibers per cc. And what we're dealing with here is, we're trying to see how much exposure to asbestos would get you over that background level, correct?
A. Yes, sir, that's correct.
Q. And why is that significant?
A. It's indicative of somebody getting exposed to a lifetime's worth of asbestos in a rather compressed -- increasingly compressed period of time. Which of course is of significance in terms of the risk of the individual's health.
Q. And then if we go from the .1 fibers to 1 fiber per cc, what's the math and let's finish out the chart.

A. There we've got two and a half days, roughly, it would take to inhale a lifetime's worth of asbestos at ambient concentrations.

Then at the bottom at 30 fibers per cubic centimeters of air which is towards the upper range of exposures for gasket removal, it would only take 41 minutes to inhale that quantity of -- or that number of asbestos fibers.

Q. So when we're talking about 30 fibers per cc, if we're looking at the type of numbers that Dr. Longo, and have been published by others -- when we're anywhere near 30 fibers per cc, we're talking a matter of minutes of exposures to get you above background?

A. That's correct, sir.

Q. Okay. Now, what's the AIHA?

A. That's the American Industrial Hygiene Association. That's, I think, the largest organization at least in the United States, to which industrial hygienists, myself included, are members.

Q. Now as an industrial hygienist, you don't deal with what specifically causes disease in an individual. But do you deal with things about what increases individuals' risks for certain diseases?

A. Yes, sir. That's very important for an industrial hygienist to understand.

Q. Why is that important for an industrial hygienist to

understand risks of diseases in trying to formulate ways to protect everybody?

A. Because there are many, many different stressors in the work place, even just limiting it to dust like asbestos. We have a spectrum of stressors that range anywhere from nuisance dust, which don't really have any physiological effect on the body, but are just problematic in terms of eye, nose and throat irritation, through a spectrum of different disorders that can occur, all the way up to very severe and life-threatening diseases such as asbestosis and mesothelioma.

So in order to allocate resources effectively, again, going back to the proper recognition of the health hazard and the control of the health hazard, we as industrial hygienists need to be aware of these things to carry out our work in an effective manner.

Q. And as an industrial hygienist, have you become aware of the AIHA's statements concerning asbestos-containing flooring materials, and whether there's risks for those type of materials?

A. Yes, sir, I have been.

Q. And I have up there on the board something we talked to Mr. Boelter about. Do you agree as a industrial hygienist that the AIHA has published that there's no safe threshold of exposure to asbestos?

A. Yes, sir, I do.

Q. And in fact, that's not a minority position. Have you become aware of the EPA in regards to such things such as ship scraping, which is when ships that are basically taken down and torn apart. Have you become aware of the EPA's regulations concerning asbestos in those types of situations?
A. Yes, I have.
Q. And I have the guide for ship scrapers, "Tips for Regulatory Compliance". And the EPA talks about that same issue of whether there's a safe threshold of exposure to asbestos, correct?
A. Yes, they do.
Q. Mr. Templin, as a certified industrial hygienist, do you have an opinion whether there is any known safe level of exposure to asbestos as it relates to industrial hygiene?
A. Nothing to that effect has been demonstrated so far.
Q. And does the EPA, OSHA and NIOSH agree with your opinion?
A. They do.
Q. Now I showed this particular sign to Mr. Boelter. Are you familiar with asbestos abatement, the CAL-OSHA requirements and OSHA requirements concerning asbestos?
A. Yes, sir, I am.
Q. And Mr. Boelter and I had a joke about the fact I bought this off the Internet.
Even though I bought this sign off the Internet from a place that sells these type of signs. Have you seen this

exact same type of signs on work sites and as a professional in industrial hygiene?
A. Many times, yes, sir.
Q. So this isn't something I just came up with?
A. No. This is nothing new or novel, as far as I'm concerned.
Q. Okay. And the fact that it talks about dangers such as gaskets and structures, fireproofing and pipe insulation, these are things that are known about in place asbestos, not just people working with and manipulating asbestos products, correct?
A. Yes, sir.
Q. And in fact, OSHA has talked about, in the context, again, of former naval vessels or maritime vessels, they put out a fact sheet concerning asbestos, are you aware of that?
A. Yes, sir, I am.
Q. And in fact, they discuss insulation, clothing -- cloth over insulation, cable, lagging, pipes, adhesives, gaskets on piping connections, and valve packing. That's all the type of stuff that this sign warns of too, correct?
A. Yes, sir, it is.
Q. And in fact, in this fact sheet they list and show hazards of materials; is that correct?
A. They do, yes, sir.
Q. And what do they tell us about the hazard -- hazardous

materials concerning asbestos that are found on board former, either naval vessels or maritime vessels?
A. They point out in this schematic, the likely locations of such things as were discussed in the narrative, namely asbestos adhesives, asbestos mastics, the lagging and insulation, asbestos gaskets, asbestos valve packing. All the things to be concerned about as a health hazard aboard these ships.
Q. Now, Mr. Templin, have you reviewed the OSHA requirements concerning whether when working with asbestos-containing materials, say in the 19 -- after the 1990s and into 2002 if you were going to publish a peer-review article, whether working with those particular products, particularly gaskets and packing, if you were scraping them, whether you should wear a mask or respirator; is that something you're familiar with?
A. Absolutely, yes, sir.
Q. And, in fact, have you reviewed items like Garlock's own Material Safety Data Sheet that talks about the requirements for use of masks or respirators during that type of work?
A. Yes, sir, I have reviewed this.
Q. And we talked very briefly about Mr. Boelter and his study. Have you reviewed that study?
A. Yes, I have.
Q. And in fact, that's one of the things that you, as a

certified industrial hygienist, wrote a letter to the editor on concerning, correct?
A. Yes, I did.
Q. And is it a good work practice to grind on a asbestos-containing valve, or potentially -- not all of the fittings that he used actually contained asbestos. But if you don't know that they contain asbestos, is that a good work practice to grind on that valve without any respiratory protection?
A. Definitely not. Certainly, Mr. Boelter who appears in this photo, after first shaving his beard, which is required to wear a respirator, should have been wearing one.
Q. Now, you've reviewed the historical documents concerning the Bremerton Naval Shipyard, correct?
A. Yes, that's correct.
Q. And in fact, even when they were punching gaskets out, not even grinding on them, did they use at least a mask?
A. Yes, sir, they did.
Q. And, in fact, even people that were just punching out asbestos sheet gaskets, the same type of thing we're talking about here, they were using supplied air respirators, right?
A. They were. Plus obviously they've got the area cordoned off and appropriate sign indicating that one's not to enter that area.
Q. And even there they're using a half-face mask or

respirator, and that's not even grinding on these materials, that's just stamping them out, correct?
A. Yes, sir, that's correct.
Q. And those would all be good work practices, right?
A. Yes, they would.
Q. Now there was some discussion about Cheng and McDermott. Did Cheng and McDermott also make recommendations whether masks or respirators should be worn during these work practices in 1991?
A. They did, yeah.
Q. That was prior to Mr. Boelter's study?
A. Yes, well prior.
MR. HARRIS: Your Honor, we just ask that he display the whole sentence and not just take the fragments out when he displays a slide like that.
THE COURT: Okay.
MR. FROST: Your Honor, they've already handled it on cross before.
THE COURT: Go ahead.
BY MR. FROST:
Q. And in fact, when Mr. Millette just did his study, they also used full-faced respirators, correct?
A. Yes, sir.
Q. Okay. I also showed Mr. Boelter this particular diagram. What are we looking at there? What is the work practices

there?
A. Those are the work practices prescribed for class two asbestos work, under which work with packing and gaskets falls.
What's depicted here is a glove bag set up to effectively surround the area that's going to be worked on, so that if any fiber released don't get out into the environment, impact the person doing the work, or others possibly in the vicinity.
They're using a Hudson sprayer to keep the product wet at all times while it's being and handled. You can see the arms of the glove bag which the person is going to have to use in order to physically access and do the work that is required within that glove bag.
Q. And so basically what we have is a huge bag, and you put your hands through here so you can do work inside that bag so nothing gets out?
A. Exactly.
Q. And in fact, what you have to do is, you take a sprayer and you spray down the area, even though you're in a bag with your hands trying to make sure all the asbestos doesn't get out, but you still have to water it all down?
A. Correct, sir. That's required by the standard for that work.
Q. And Mr. Templin, is this something that I made up? I mean, Mr. Boelter seemed to laugh when I asked him this

question.
A. No, sir. That's not something you made up.
Q. In fact, if you're working with asbestos-containing gasket materials, isn't this what you're required under the regulations?
A. Yes, it is.
Q. And again, what are we looking at there?
A. Something similar. We have a glove bag set up around a section of piping.

In this case the individual looks like he actually has his hands within the gloves and arms of the enclosure system, so that he can begin to do work.

Of course you can see he's got respiratory protection and the full body protective coveralls in conjunction with respiratory protection that he's using to do this work.
Q. So he has a full body Tyvex suit. He's got a mask or respirator. He has it watered down, and he has his hands inside of a bag, and this is all just to manipulate asbestos-containing gasket material?
A. That's required to do so, yes.
Q. And in fact, if we look at Federal Registry, just so everyone knows you and I didn't make this up, if we look at the Federal Registry it talks about this exact same thing, correct?
A. Yes, sir, it does.

Q. And in fact, what it does is it talks about gasketing materials, and the work practices that are required. What are the work practices that are required if we're dealing with gasket materials?
A. It specifies that if the gasket is deteriorated and unlikely to be moved intact, the removal has to be undertaken within a glove bag, as described. And it goes into the prior section of the standard that goes into detail about how glove bags are to be utilized and installed.
That the gasket shall be thoroughly wetted with amended water. Amended water just means that it has a surfactant added to it to enhance its ability to penetrate and keep asbestos fibers adequately wet, prior to removal. And that the wet gasket shall be immediately placed in disposal container. And that any scrapings remove residue, has to be performed while keeping the material wet.
Q. And so not only are we talking about keeping the material wet, all the materials have to be treated as in a special bag, marked as asbestos-containing and taken to a special landfill that can take away asbestos?
A. That's correct.
Q. And, in fact, they have -- and I'm not sure we can all read that, but the amount of the bags, how many mils the bags are, the work practices, all the different things about the glove bags, all is highly regulated concerning anyone who's

going to do this type of work?
A. Yes, sir. It's very carefully specified.
Q. So do you have an opinion as a certified industrial hygienist whether this type of working with asbestos-containing gaskets in the late 1990s, in the 2000s without a mask or respirator, was that in violation of any OSHA regulations?
A. Yes, it would be.
Q. Now you also have become familiar with Mr. Boelter's letter to OSHA?
A. Yes, I have.
Q. And Mr. Boelter, under cross-examination, seemed to indicate he thought that OSHA had not read his particular study in their commentary. Have you reviewed his study and have you reviewed OSHA's commentary in detail?
A. Yes, sir, I have.
Q. Can you comment on whether -- what you believe is important about what OSHA discussed back to Mr. Boelter when he tried to get gaskets exempted from the warning label requirement?
A. Yes. They really addressed that on two levels. One of which Mr. Boelter has acknowledged that he lacked the standing to petition OSHA for such a variance. But the second part of it had to do with the fact in OSHA's view and their analysis of Mr. Boelter's own data, that it would be reasonable to

expect a person to be exposed above their permissible exposure limit, doing the tasks that he did with the amounts that he measured, if instead of working with eight gaskets during the course of the day, the individual worked with 10 gaskets during the course of the day.

Q. So if we just add two more gaskets per day, that then would take -- even using Mr. Boelter's number -- you above the permissible exposure level of OSHA?

A. Yes, sir, that's correct.

Q. Okay. And this permissible exposure level, that's never been designed to protect against diseases like mesothelioma, correct?

A. That is correct, it has not.

Q. And as we sit here today, does OSHA and the EPA regulate all types of fibers, whether they're chrysotile, crocidolite or amosite, the exact same?

A. Yes, sir, they do.

MR. FROST: Thank you, sir.

Pass the witness.

THE WITNESS: You're welcome.

THE COURT: Mr. Guy.

MR. GUY: No questions for this witness, Your Honor.

THE COURT: All right. Mr. Harris, I guess.

MR. HARRIS: Can I have just one second, Your Honor?

THE COURT: Yes, sir.

MR. FROST: Your Honor, just so the record is clear, we offer ACC 1002, ACC 3312, ACC 3315, ACC 3313, and we offer Mr. Templin's CV, which is ACC 3251, all as substantive evidence. And we offer ACC 3252, ACC 3253, and the PowerPoint, which is ACC 3255. 3252 is his report; 3253 is his rebuttal report; and 3255 is his PowerPoint.

We offer those for demonstrative purposes and Rule 104 purposes.

THE COURT: All right.

MR. HARRIS: Generally, Your Honor, we don't have objections to their offer of that. I think there's a mislabeling on one of their exhibits, one of their ATI minutes. We just need to confirm that to make sure we know what we're talking about.

THE COURT: We'll admit those and hope you all get the numbers straightened out.

(ACC's Exhibits No. 1002, 3312, 3313, 3315, 3251, 3252, 3253, 3255 were received into evidence.)

THE COURT: Are you ready or do you want --

MR. HARRIS: Yes, I'm ready. Your Honor.

THE COURT: Okay.

MR. HARRIS: Sorry for the delay.

THE COURT: No problem.

CROSS EXAMINATION

BY MR. HARRIS:

Q. Good morning, Mr. Templin.
A. Good morning, sir.
Q. You work for MAS; is that correct?
A. Yes, sir, that's my employer.
Q. Dr. Longo is your boss, correct?
A. Yes, he is.
Q. I want to ask you a few questions about your experience with asbestos gaskets and packing. You've never worked with asbestos gaskets or packing in an industrial setting; is that correct?
A. Yes, sir, that's true.
Q. You've never worked with asbestos gaskets or packing in a naval or shipyard setting; is that correct?
A. It is.
Q. You've never monitored for potential exposure to asbestos from gasket or packing work in all of your experience, true?
A. Yes, sir.
Q. And you've never even seen asbestos gaskets or packing used in an industrial, naval or shipyard setting; is that true?
A. Yes, sir, it is.
Q. Mr. Templin, you've never been an industrial hygienist with responsibilities at a particular refinery or chemical plant, correct?
A. In terms of being employed as an industrial hygienist by

such an entity, no. In terms of having been hired as a consultant industrial hygienist by such entity, yes.
Q. In terms of having responsibility of the safety and health of the day-to-day operations involving workers, that's not something that you've ever had, correct?
A. Only insofar as a consultant, I've advised them as to the appropriate things to do. But as you put it on a day-to-day basis, it was then up to them to follow through with that advice.
Q. And so you've never been an industrial hygienist that worked at a refinery or chemical plant, true?
A. Other than the manner in which I just indicated, that is true, yes.
Q. And you've never been an industrial hygienist that worked in a shipyard, correct?
A. Correct.
Q. You never worked for the Navy, correct?
A. That's true.
Q. You have never received any awards for risk assessment or exposure assessment from the industrial hygiene community, true?
A. That is true.
Q. In fact, you've not received any awards for your work at all in the industrial hygiene community, correct?
A. Not so far.

Q. And you've never -- you said that you were not a prolific author in the peer-reviewed scientific literature. In fact, you haven't published anything, correct?
A. That's not --
Q. In the peer-reviewed literature?
A. That's not quite, correct. But as memory serves, I think it's been restricted to one publication.
Q. What was the one peer-reviewed publication?
A. That was the response to Mr. Boelter's study that we've already discussed.
Q. So this is a letter that other people from MAS signed including you, correct?
A. I drafted it, others within MAS commented on it, and we all signed it.
Q. And that's your only -- only publication in the peer-reviewed literature is a letter criticizing Mr. Boelter's paper?
A. Yes, that's correct.
Q. Okay. I believe you indicate in your deposition that you didn't think you had a chance to respond to Mr. Boelter's letter; is that correct?
A. No, sir. That's not what I said in my deposition.
Q. Well, you wrote the letter. Mr. Boelter served the response. You actually said you did have an opportunity to respond, but you all chose not to, correct?

A. Yes. Effectively, as I saw it, the level of discourse had descended to kind of a schoolyard caliber of, you are so; no, I'm not type of thing. I didn't see any point in responding in that fashion.
Q. Okay.
A. Our points had been made. The readers -- I was happy to let evaluate those points on their merits and move on.
Q. Okay. I want to talk to you about what you did and did not do in this case. You did not do any independent -- or you did not do an independent systemic review of the literature to determine which papers that you would cite to the court in your report, correct?
A. As phrased in your question, I would have to say that's correct.
Q. You did not review any of the questionnaires or supplemental questionnaires; is that correct?
A. Yes.
Q. You did not review any of the depositions that the claimants submitted; is that true?
A. Yes, it is.
Q. You can't offer any analysis of the current claimant's exposures from work or operations involving asbestos gaskets or packing, correct?
A. Absent having done that review, you would be correct.
Q. Mr. Templin, the materials that you cited to the court

and what you discussed this morning, are materials that you reviewed -- you received from Waters and Kraus back in 2002; is that correct?
A. Most of those are, yes.
Q. In fact, in your deposition you said that everything that you cited to the court, which is what we saw this morning, was a subset of what Waters and Kraus had provided to you in 2002 in the MacDonald case, correct?
A. Yes, sir, I believe that is correct.
Q. And what we're talking about is that Waters and Kraus provided you two box -- I believe it was two boxes, maybe three boxes of documents, correct?
A. Precise number of boxes, I don't recall. But it was a fairly large collection of documents, that's correct.
Q. They flagged certain pages in those documents that they provided you, correct?
A. Yes, sir, they did.
Q. And they highlighted certain passages for you, correct?
A. True.
Q. That's what we saw this morning, correct?
A. Some snippets of that, yes.
Q. Yes. The gasket studies that you cite in the paper -- or in your report, are studies that were provided to you by -- well, we say studies. The studies and the samples that you cite in your report are a subset of the documents that Waters

and Kraus provided you, correct?
A. Some of them are, yes.
Q. Well, aren't all of them?
A. I don't know that Mr. Boelter's report was included in that, but -- which I also cite to. But with that exception I believe you're right.
Q. And so the industrial hygiene literature that you have and that you cite to the court, is literature that came to you through Waters and Kraus, correct?
A. I would say in terms of their origin, that would be accurate.
Q. This isn't the result of -- I think you said at your deposition, you never went to the library to do a search and see what was in the industrial hygiene literature with respect to gaskets and packing, true?
A. That's correct. I did say that.
Q. You were not familiar with any of the articles or documents that had been provided to you by Waters and Kraus in 2002 before they provided them to you, true?
A. I believe that is correct.
Q. I want to ask you just briefly about Dr. Longo's Tyndall lighting demonstrations. You're a certified industrial hygienist, right?
A. Yes, sir, I am.
Q. But -- and Dr. Longo has done studies involving gaskets

since you joined MAS back in 2002, correct?
A. Yes, he has.
Q. And -- but you have not been invited to participate in any of those studies, correct?
A. That's correct.
Q. With regard to Tyndall lighting, you've never used Tyndall lighting as an industrial hygienist in the field, correct?
A. Yes, that is correct.
Q. You've never used Tyndall lighting outside of the courtroom, true?
A. Me personally, that is correct.
Q. And you're not an expert in photography or videography, correct?
A. I agree with that.
Q. And you're not an expert on the limitations of off-the-shelf video cameras that Dr. Longo used, correct?
A. That's correct, I am not.
Q. And that's your understanding that this is a video camera that he used in a study that he used to film birthday parties, true?
A. They're put to a variety of uses, I suppose that's one of them.
Q. And you're not an expert in -- based on what you know, you can't say that respirable asbestos fibers are sufficient

size to scatter enough light that would be detected by an off-the-shelf video camera, true?
A. An individual asbestos fiber respirable in size, that's true. A large collection of them in the air obviously can.
Q. Has to be a high concentration though, correct?
A. Concentrations in the range that we were measuring them and that we had seen in the ranges provided to this court, yes, sir.
Q. That's interesting. Are you saying now that respirable asbestos fibers can scatter light to be recorded on a video camera?
A. In a sufficiently high concentration, yes, sir.
Q. What research have you done?
A. It's pretty clear, I mean, we have done this. We, being MAS, on numerous occasions. As was indicated yesterday, this is a method of the Health and Safety Executive of Great Britain for detecting hazardous substances. So it's quite clear as we saw very vividly in yesterday's videos, that very small particles, even molecules, are capable of scattering light in the fashion that can be detected by the human eye.
Q. When you talk about molecules, you're talking like, about particulates and cigarette smoke?
A. Well, I was thinking specifically of the nitrogen molecules that comprise most of the atmosphere and result in our perception of the sky being blue.

Q. What's the concentration of those particles, per cubic centimeter?
A. I couldn't give you that off the top of my head.
Q. Okay. You understand that cigarette smoke, for example, those are really small particles, correct?
A. Yes, those are quite small.
Q. Less than one micron?
A. Correct.
Q. But we're talking about billions per cubic centimeters, correct?
A. As we discussed at my deposition, that's not something I've had a chance to review, so I'm not in a position to either agree or not with that statement.
Q. You read the report of Dr. Hesselink that Garlock prepared or submitted in this case?
A. I can't say that I perused it, but I did take a look at it, yes.
Q. Dr. Hesselink is a professor of physics from Stanford University in electrical engineering and physics, correct?
A. That's my understanding, yes, sir.
Q. He's an expert in optics, correct?
A. I didn't thoroughly review his CV, but I don't have any reason to take issue with you.
Q. You recall that when the Hubble Telescope was in trouble in the late 1990s, he was asked to consult and help fix the

Hubble Telescope, correct?
A. No, I was unaware of that, sir.
Q. Okay. You understand he's done an experiment in his lab with respect to respirable-size asbestos particles, and calculated the amount of light that is scattered by respirable-size particles?
A. The way I read the report is, he was doing it on a particle-by-particle basis, not on a suspension of aerosols in the air.
Q. As he demonstrated in his laboratory experiment, a respirable asbestos size particle is not large enough to scatter sufficient light to be reported by an off-the-shelf video camera, true?
A. A single particle that's correct, that's my understanding.
Q. And then he also constructed a mathematical model to evaluate what would -- whether -- how much light was scattered from a particle where the light hits it from different angles as if it's tumbling in the air, correct?
A. That I did not review the report closely enough to -- as I said, I didn't peruse it, so I can't say one way or the other.
Q. You understand though from his ultimate conclusion, that even when the fiber is tumbling in the air, it's not going to scatter enough light to be reported by an off-the-shelf video

camera, correct?
A. A single fiber, yes, that's my understanding.
Q. Then he also calculated the amount of light that would be scattered from a concentration of respirable-sized asbestos particles that were one or two orders of magnitude higher than the concentrations even reported by Dr. Longo, correct?
A. That I couldn't say. I haven't, as I said, read the report in that level of detail.
Q. Well, ultimately in his conclusion in his report was that at respirable-size asbestos particles, even at the concentrations reported by Dr. Longo, are orders of magnitude too small in order to be recorded by an off-the-shelf video camera, correct?
A. I don't know.
Q. You didn't read the report?
A. As I said, I did not peruse it. I went through portions of it, but I didn't read word for word the entire thing, no.
Q. All right. Let's turn to your experience with insulation. Your work -- or your -- after you got out of graduate school, asbestos exposures in the real world from insulations were in the process of being controlled; is that correct?
A. They were beginning to be, yes, sir.
Q. You don't have any personal experience with uncontrolled exposures from asbestos insulation, true?

A. I believe that's correct.
Q. The only knowledge you have about how valves and fittings may have been insulated historically, come from the documents that Waters and Kraus provided you; is that correct?
A. Well, that and a large number of other things that I've read and consulted over the years since then.
Q. Since you became a consultant for lawyers in asbestos personal injury litigation?
A. Well, since 2002, yes, sir.
Q. And, for example, Waters and Kraus didn't provide you the BuShips Technical Manual, correct?
A. I don't believe they did, yes.
Q. Have you reviewed the BuShips Technical Manual to understand how valves and fittings were insulated?
A. That particular document, no.
Q. You understand what the BuShips Technical Manual is, correct?
A. I have some understanding of it. I can't claim to have a detailed one.
Q. You would agree though, that the historical work with and around asbestos insulation when it was not controlled, could result in significant exposures from an industrial hygiene perspective?
A. Yes, sir, I would agree with that.
Q. You also have some understanding of the fiber types in

which -- that comprised asbestos thermal insulation, correct?
A. I do, yes, sir.
Q. That included amosite, right?
A. Depending on what time or what era we're talking about, and what type of product, yes, it could.
Q. You have an understanding from your review of the literature that uncontrolled exposures to asbestos from removing pipe covering, can result in exposures in the hundreds of fibers per cc?
A. Within the restricted areas in the holds of ships, such as engine rooms and boiler rooms, yes, I have seen results that high.
Q. Well above all current and historic standards, correct?
A. Yes, sir.
Q. You recall testimony from other cases which you've consulted in where the plaintiffs have described snowstorms of dust created from the insulation work?
A. Yes, I have.
Q. You recall depositions that you reviewed from the 1990s where people described removing insulation with hammers, correct?
A. On occasion I have seen that described, yes, sir.
Q. And you understand that workers, including pipefitters, would need to remove insulation in order to access the flange to remove a gasket, correct?

A. That's not something pipefitters typically did, but they did from time to time, yes.
Q. I want to ask you, you have not reviewed the testimony of current claimants in this case, that's right?
A. Yes, that's correct.
Q. I want to show you some testimony. We put their initials up there because their names are confidential.
We asked claimant with the initials C.O.:
"When did you start working at Union Carbide?
"1947 to 1974."
He was asked about his work practices:
"Did your work require you to work with asbestos insulation hands on?"
Oh, I should point out, he was a pipefitter.
A. I see that. Thank you, sir.
Q. "Did your work require you to work with asbestos insulation hands on?
"Oh yeah, especially when we were removing it from the pipeline and pumps, et cetera. We just took a wrench and started cracking it, pulling it off, cutting the wire."
That's consistent with your understanding of how pipefitters would remove insulation?
A. It's something that I have seen from time to time, yes.
Q. He described it as being pretty dusty.
There's another pipefitter with the initials J.M.:

"I want to talk to you a little bit about your work at Humble Oil. You worked there from 1950 to 1958?

"How did you come into contact with gaskets at Humble Oil? What was your position?"

He was a pipefitter/helper.

"Have you had the opportunity to remove pipe, old pipe insulation?

"Yes.

"What kind of pipes you have the opportunity to remove pipe insulation off of? Hot pipes, cold pipes, both, do you remember?

"Usually hot pipes.

"If you would, describe how you used to remove pipe insulation.

"Well, we always cut the bands and just taking a hammer or a chisel or whatever and pry it off or knock it off."

That's consistent with what you've heard about the historic practices of pipefitters?

A. Again, that's a practice that I've seen described from time to time, yes, sir.

Q. We'll look at one more current claimant with the initials B.D. He worked at Bethlehem Steel from 1952 to 1985.

He said he was a millwright when he left Bethlehem Steel.

"Based on what you observed, how would you go about removing asbestos insulation from the water piping?

"They'd knock it off.

"With what?

"A hammer.

"Would that create dust?

"Yes."

All consistent with your knowledge of historical work practices, correct?

A. On occasion, yes.

Q. And these are the current claimants that you understand are before the court, correct?

A. Some of them, yes.

Q. You took some air samples when you were with CAL-OSHA; is that correct?

A. Yes, sir, I did.

Q. That was part of your responsibilities in the early '80s -- or in the '80s?

A. Yes, sir, it was.

Q. When you moved into private consulting though -- and after you left CAL-OSHA, you've been in private consulting ever since, correct?

A. Yes, I have.

Q. Even before you joined Dr. Longo, correct?

A. Yes, sir, that's correct.

Q. You haven't collected a lot of air samples since you went into private consulting; is that correct?

A. If we're talking about industrial hygiene air samples collectively, I have collected a lot. If we're talking -- if you're intending to limit it to asbestos only, then you would be accurate.
Q. Okay. Are you familiar with all the details of NIOSH 7400 and NIOSH 7402?
A. I'm certainly familiar with the methods overall and some of their requirements. I don't claim to be in a position to recite all the elements of those rather lengthy and complex methods to you from memory.
Q. Mr. Templin, I would like to ask you about some of the industrial hygiene samples that you cited to the court in your report. Many of those industrial hygiene samples are just handwritten data sheets, correct?
A. Yes, sir, some of them are.
Q. We've heard a little bit about a sample at -- collected by the Industrial Health Foundation in 1978 at a Garlock facility. You cited to this, correct?
A. Yes, sir, I did.
Q. Just like you to put this in context for us. That was a 10-minute sample, right?
A. Correct.
Q. And the result is 4.58 fibers per cc. In 1978 there was an excursion limit by OSHA, correct?
A. At the time they termed it a "ceiling limit". Yes, I see

where you are going.
Q. And the ceiling limit was 10 fibers per cc over 15 minutes, correct?
A. It didn't have to necessarily be over 15 minutes. But the ceiling limit was expressed as 10 fibers per cubic centimeters, yes.
Q. And that was the benchmark to compare short-term exposures, correct?
A. In terms of determining strictly whether you were or were not in compliance with the existing OSHA regulation, that would be true.
Q. So this sample would be below the ceiling limit -- the OSHA ceiling limit when it was collected and analyzed, correct?
A. Yes, sir, that's correct.
Q. And it was collected and analyzed using a technology that doesn't distinguish asbestos fibers from nonasbestos fibers, correct?
A. Yes, sir, that's true.
Q. And this is really all you know about this gasket is that -- or this sample, is that -- or this sample is that it just says, "removing gasket from flange" is what it appears, correct?
A. That's the way I read it, yes.
Q. You don't know what type of gaskets it was, whether it

was spiral wound or compressed sheet or beater add (phonetic) gasket, correct?
A. The document doesn't specify that, you're correct.
Q. You don't know what kind of service it was in, whether it was steam service, water service or what it was, correct?
A. Correct, I do not.
Q. Actually, just looking at this document you don't know for sure that it was even an asbestos gasket, right?
A. I think it more likely than not it would have been, in as much as that's what the Industrial Health Foundation was there to assess, and there would be no point in doing so for a gasket that was not an asbestos gasket.
Q. Okay. But this is all you know about this. But you think it's reliable to cite to a handwritten data sheet like this?
A. Absolutely.
Q. You've cited the Shell sample as well, correct?
A. Yes, sir, I have.
Q. This is -- the Shell sample is -- this document says, "Simulates Worst Case Situation", correct?
A. Correct.
Q. There was no indication they tried to use a scraperzlz to try to remove the gasket before they started grinding it, correct?
A. That's correct. At least they don't discuss it if there

was.
Q. And actually this brings us to a topic I wanted to address with you. When you talk about an OSHA regulation with the removal of gaskets, actually in 1972, OSHA passed a regulation that prohibited the use of power tools when you're removing or working with asbestos products, correct, unless they're ventilated?
A. Well, I was going to say, that's not entirely equipped. If they're equipped with local exhaust ventilation, they were permitted to be used at that time.
Q. Right. So there's no indication that this grinder that they used, or the tool they used to remove the gasket had local exhaust, correct?
A. Well, as you say, sir, they were trying to simulate worst case conditions. So you're correct, there is no indication that that would be in place, or that it would be appropriate for the type of work practice that they were trying to simulate.
Q. And so, they're trying to simulate the worst case situation and violating OSHA at the time, correct?
A. They did have the area sequestered from the rest of the work site, and they did have the person wearing suitable personal protective equipment and a respirator. But if that were being done, not in a test scenario, but on the premises itself, without any such controls in effect, yes, you're

correct. That would be a violation of the OSHA standards that existed at that time.
Q. And no background samples were collected before this activity was done, correct?
A. My understanding is that that's true.
Q. And they were using a technology to which they could not identify handwritten -- I'm sorry. They were using a technology where they could not identify asbestos fibers from nonasbestos fibers, right?
A. For the analytical method, yes, you're correct.
Q. You also cited, and I believe Mr. Frost showed you the bottom picture in Dr. Millette's 1995 article; is that correct?
A. Yes, sir.
Q. I want to ask you some questions. This came up in Mr. Liukonen's exam and then again yesterday with Dr. Longo. This has to do with the power wire -- I want to ask you about the power wire brushing, 6.8 fibers per cc.
Do you understand from the article what the length of the sample is?
A. I'd have to go back and take a look at it. I don't have the article committed to memory.
Q. Okay. Do you have an understanding this was in fact a four-minute sample?
A. I can't say, as I said, that I've got all those details

committed to memory. My understanding is that it was not certainly a full-shift sample, or an eight-hour time-weighted average sample.

Q. Well, let me show you Dr. Millette's testimony.

MR. FROST: Your Honor, my only objection is, this is Dr. Millette's testimony. He asked him about the article. He needs to show him the article.

MR. HARRIS: Fine.

MR. FROST: Two separate things.

THE COURT: Okay. Why don't we take a break. Let's go ahead and take our morning break and come back at 10 minutes after 11:00.

As I mentioned yesterday, we'll go just shy of 12:30 and take a break.

(A brief recess was taken in the proceedings at 10:59 a.m. Court was back in session at 11:13 a.m.)

THE COURT: We're back. Mr. Harris.

BY MR. HARRIS:

Q. Mr. Templin, when we took our break, we were discussing Dr. Millette's gasket article; is that correct?

A. Yes, sir, we were.

Q. I provided you a copy of it during the break?

A. You did.

Q. Did you have a chance to flip through it?

A. No, I did not.

Q. Oh, okay. The reference to the 6.8 fibers per cc for power wire brushing, there's no indication of how long of a sample that was, correct?
A. If memory serves, I believe that is correct.
Q. And I asked you whether if you knew whether it was a four-minute sample and you said you didn't recall that or you didn't know that, correct?
A. Yes, sir, that's correct.
Q. And best of your recollection, the paper does not describe that sampling time, correct?
A. I don't believe it does.
Q. I've displayed Dr. Millette's deposition from the Schiller case, where he explains that the 6.8 fibers per cc is a four-minute sample.

"You're referring to your 6.8 fiber per cc result, correct?

"Right.

"Because that's comparable to the power wire brushing, I assume.

And that was a four-minute sample, correct?

"Yes."

So the 6.8 is a four-minute sample that's -- if you time-weighted that -- the short-term exposure limit by OSHA currently, is a 30-minute time-weighted average, correct?
A. Currently, that's correct.

Q. It's not a ceiling limit, correct?
A. Not at this point, no.
Q. If you time-weighted the four-minute sample over the 30 minutes based on the information we have, the result would be below the short-term exposure limit, correct?
A. I would have to do the math on that one.
Q. Okay. But you would multiply 4 times 6.8 and divide it by 30, correct. That's how you do the math.
A. Yes. And if you did that, you would be just barely below one, and with --
Q. Be below the short-term exposure limit, correct?
A. And you take into account the ordinarily assumed error range, your upper bound on that would be above the excursion limit.
Q. But the result itself is below the short-term exposure limit, correct?
A. The bare naked number would be, yes, sir.
Q. All right. And with no indication that the 6.8 fiber per cc power wire brushing result occurred or was taken after someone had actually tried to remove the gasket with a scraper, correct?
A. I don't know if there is any such indication in the report or not.
Q. As far as you're sitting here today, you just don't know whether there was any effort to try to get up underneath the

gasket and remove it, like Mr. Shoemaker described yesterday, correct?
A. That's correct. I don't know that one way or the other.
Q. All right. The -- going to ask you about Dr. Longo's paper. I'm not expecting you to say anything negative about Dr. Longo, since he's your boss. But I did want to ask you a little bit about the methodology that he followed.
There are -- he was to follow, based upon what he describes in his published paper, and that's really what you rely upon is his published paper, correct?
A. In terms of what I selected as reference material for this case, his published paper is among the sources that I've reviewed and considered, yes, sir.
Q. And you saw Mr. Hatfield's testimony where those studies actually had to be redone because of -- to fix quality control problems, correct?
A. I saw that that was testimony from Mr. Hatfield, yes, sir.
Q. And he was involved in the study, correct?
A. Yes, he was.
Q. Okay. But in the published paper, Dr. Longo said that he was -- that the samples were analyzed and collected in general accordance with NIOSH 7400, correct?
A. Yes, sir.
Q. And I asked you about that at your deposition about, you

know, what does that mean? Does that mean someone's not following the methods? And you said that was standard language.

A. Correct.

Q. All right. It's standard language, and I was struck. You said, "As you sit here today" -- oops. Sorry. Wrong -- wrong quote.

Just a second.

When I asked you about it you said, "The method is many pages long. It has got many components to it, and again basically if you say you are following the method, then you are saying -- you are assuring in fact that you have crossed every T and dotted every I. Nobody in the practice of engineering or laboratory does that".

That's what you said?

A. It is.

Q. That's what you believe?

A. Yes. If we're talking about claiming to follow the method precisely, that's correct.

Q. Right. Nobody -- in your experience -- at least your experience with MAS, nobody crosses every T or dots every I. That's just not the practice; is that correct?

A. That's not quite the same thing. What I said is -- and this goes back to my 15 years of experience with Law Engineering, a multi-national engineering and environmental

consulting firm. We don't hold that out as what we are doing, nor does any other responsible professional in that field. As I said in the deposition, you can't make such an assurance on an across-the-board basis.

Q. And so your experience and practice is not to follow every letter -- or every method to the letter; is that correct?

A. No. My practice is to make one's best effort to do so. But recognizing that we're all humans, and hence potentially fallible, not to assure that one has done so.

Q. Okay. It's got many pages to it, right?

A. Certainly does.

Q. I want to ask you briefly about the documents that you spoke about. Mr. Frost asked you about the Merewether and Price article from the early 1930s in Great Britain, correct?

A. Yes, he did.

Q. Merewether and Price were studying asbestos exposures in textile factories, correct?

A. Textile factories and other settings, yes, sir.

Q. The packing and gaskets that are mentioned, are mentioned in reference to the manufacturing of those products, correct?

A. Yes, that's correct.

Q. Not in the end users using the products, right?

A. Not specifically, that's correct.

Q. And in fact, you said in your report that the first

mention of asbestos-containing gaskets and packing as a potential health hazard for those engaged in their ordinary and custom use in the workplace of which I am aware is Harries in 1968, correct?

A. Yes, sir. That's correct.

Q. Now, they were talking about potential hazards of textile industries in the '30s and in the mines in the 1930s and before, correct?

A. Yes, sir, they were.

Q. Then probably as early as the 1940s they were looking into potential exposures from asbestos insulation, correct?

A. I'd agree with that, yes.

Q. And certainly by the early 1960s, Dr. Selikoff was investigating and publicizing what his research was with respect to the incidents of disease in insulation workers, correct?

A. Yes, that's correct.

Q. And all those years, at least up until 1968, you're not aware of anyone having raised a question about the hazards of working with asbestos gaskets and packing, correct?

A. Except as mentioned by Merewether and Price, they cautioned against and they made this caution across the board, products like that should not be ground, sawn, abraded, et cetera.

Q. But you didn't interpret that when you were writing your

report to the court as talking about potential health hazards of using asbestos gaskets and packing, true?
A. Not as being specific to those products, no. But as being a category of operations, how it could generate hazardous asbestos concentrations, regardless of product.
Q. And the paper that you're citing from Harries, all it really said was, he was breaking up the categories of products that were used in industry and shipyards between dusty and non-dusty, correct?
A. He characterized the latter category as those not usually giving rise to dust, unless they are ground, sawn, polished, et cetera, the very things that Merewether and Price had warned of almost 40 years prior to that.
Q. And so he put gaskets and packing in the non-dusty category. Then you interpreted that as saying that those gaskets and packing is part of the materials in those categories if they are ground, polished or sawn, would be potentially hazardous, correct?
A. That is what Mr. Harries said, yes.
Q. But you didn't say in your report in 1971 he wrote that "There's no substitute heat-resistant material available for asbestos -- compressed asbestos sheet gaskets and packing. No health hazard in forms used in shipyard applications."
You didn't put that in the report, correct?
A. No, that's incorrect, sir. That is in the report.

Q. Oh, that quote is?
A. That quote is in there.
Q. Okay. So Harries may have raised a question about that in his 1968 paper. But in his 1971 paper, he was advising that there was no health hazard with those products, true?
A. Well, he qualifies it. And to me the statement's somewhat cryptic. He says, "no health hazard in forms used in shipyard applications." He doesn't elaborate as to what he means by that, and I'm not in a position to know what was in his mind either. But to me, that's not a blanket statement that they're absolutely devoid potential health hazards are concerned.
Q. This is a statement that Dr. Selikoff picked up and republished in 1978?
A. Yes, sir, he did.
Q. Said the same thing. You talked about ambient exposure before, you went through some calculations with Mr. Frost, correct, on direct?
A. I did.
Q. What was the background number that you were using?
A. The background number is from Nicholson's 1971 paper, and that's 0.00005 fibers per cubic centimeter, or 50 fibers per cubic meter.
Q. So that is four zeroes in front of the five, correct?
A. That's correct, sir.

Q. Now you've previously testified in other cases about a higher background level, correct?
A. Once or twice, yes, 11 years ago.
Q. Well, you were asked in the MacDonald case:
"Two zeros. So the upper bound .003. That's with fibers per cc. And the lower boundary you have for the background is at .004; is that correct?
"I think that's a pretty fair range to assign to it.
"And within that range would be known as background?
"Yes."
Do you recall that testimony?
A. Well, you forgot a zero for the four. It's three zeroes. You read off two.
Q. Oh, okay.
A. Yes, 11 years ago, that was correct.
Q. So when you were testifying 11 years ago, you had three zeroes in front of the four, you weren't using four zeroes in front of a five, correct?
A. Correct.
Q. And so your numbers and your calculations if you're using the number that you were using back in 2002, that number, all those calculations would be off by at least a factor of about 10, correct?
A. That would be about right, yes, sir.
Q. All right. Now, those calculations you went through with

Mr. Frost, is that published anywhere in the peer-reviewed literature?
A. Calculations of that sort are. That precise calculation is not, that I'm aware of.
Q. No one's gone through the effort of trying to calculate -- or no one's published, scientifically, how many fibers someone breathes in a year like that or within a lifetime?
A. Essentially, the agency for Toxic Substances and Disease Registry did that in their 2001 publication in calculating a lifetime dose of asbestos from ambient exposure. And they came up with a very, very low number. Now, they didn't do it in terms of fibers inhaled. They did it in terms of fiber years per cc.
Q. Right. They were using fiber years, not just raw fiber numbers like you were, correct?
A. Yes, sir, that's correct.
Q. Incidentally, the documents -- you said that you were using Nicholson 2005. Didn't you also cite asbestos foreign fibers?
A. Well, no. I said Nicholson, 1971.
Q. 1971? Yes, but I thought -- were you not also referring to this paper or --
A. That's a 1984 publication, I believe. That's the publication in which the data table that includes Nicholson's

findings, as well as many others is published.
Q. That's right. So Nicholson's data was reported in this paper, and you took that -- that's where you got the Nicholson number was from this paper, correct?
A. Yes, sir, that's correct.
Q. All right. When I asked you about -- I showed this to you at your deposition, you didn't recall seeing this, correct?
A. There were portions of it that you showed me in my deposition that I didn't recall, yes that's correct. The table that I have been using subsequently, I did recall, naturally.
Q. And this was a document that was provided to you by Waters and Kraus?
A. No. That's a document that I provided to them.
Q. Okay. On the industrial hygiene studies you showed some pictures from the Bremerton study; is that correct?
A. Yes, sir.
Q. And those are pictures of workers who were engaged in secondary manufacturing, correct?
A. I think that's the best way to characterize it, yes, sir.
Q. There were not any pictures in the report of people doing actual end-user work, correct?
A. Well, I think fabricating of gaskets could be considered end user. But if by that you mean actually breaking flanges

and removing the gaskets, I didn't see any photographs of that.
Q. And as far as you know, nobody was wearing masks or respirators in the context of that work, correct?
A. Well, since the report is silent on that, I don't know one way or the other.
Q. Well, you've seen the testimony of Mr. Beckett, the committee's expert. And I'm sure you've heard the testimony of Mr. Liukonen and Dr. Still, who are all the authors of the report, and those precautions were not taken, correct?
A. That I couldn't say from memory one way or the other.
Q. Okay. I wanted to ask you about the regulations you were talking about with respect to gaskets that came in effect, was it 1995?
A. '94.
Q. '94. Those regulations were actually proposed in 1990 or 1991, correct?
A. Somewhere thereabouts, yes, sir.
Q. At that point in time, OSHA had no data on gasket work. Nothing had been published in the peer-reviewed literature, correct?
A. I'm not sure that that's true. But they did not have a great deal of data to work with.
Q. The regulations you're citing were not specific to compressed sheet gaskets, correct?

A. The section that I was talking about was pretty specific -- or the one we talked about earlier today. The overall section which discusses category two, or class two, work operations, covers many other products as well.
Q. Well, with the asbestos gasket section you were talking about, it's not limited just to asbestos -- compressed sheet gaskets. It includes any asbestos gasket, correct?
A. If it's either damaged or not likely to be removed intact, yes.
Q. Okay. So it's any asbestos gasket. You understand that other materials were used besides the compressed sheet process to make asbestos gaskets?
A. Yes, sir, I'm aware of that.
Q. For example, Johns-Manville in their catalogs. They sold marinite in asbestos sheet millboard for gasketing service. You're aware of that?
A. I see what it says here that they're adaptable to gasketing service.
Q. Right. Their millboard and their marinite was used in gasketing service. That's completely different process than compressed sheet gaskets, correct?
A. I would say it's a different product, yes.
Q. For refinery service, you understand that different companies have very specific requirements for different gaskets and different services, correct?

A. As we discussed at my deposition, these are not specifications that I've seen or become thoroughly familiar with.
Q. Okay. I'll show you a specification and gasket chart for general refinery service. For sulfuric acid, they're specifying asbestos millboard. You're not aware of the use of asbestos millboard in different services for gaskets?
A. Well, to make sure the record is correct, it says asbestos composition or asbestos millboard.
Q. I'm sorry. I misspoke.
A. But to answer your question succinctly, I was not familiar with millboard being used for that purpose.
Q. Okay. And the regulations that OSHA established in 1994 for removing a gasket and taking special precautions when it cannot be -- when it's visibly deteriorated or cannot be removed intact, that would apply to the asbestos millboard that's used in refinery services, or certain refinery services, correct?
A. Yes, it would.
Q. Apply to marinite that was sold by Johns-Manville for gasketing service, if someone encountered that, correct?
A. Yes.
Q. Now those products, are you familiar with millboard and marinite?
A. Yes, sir.

Q. They're cementous (phonetic) type products; is that correct?
A. The marinite is. The millboard is more of a paper-type product.
Q. Also, asbestos paper was used for making gaskets, correct?
A. My understanding is that that's true.
Q. And those regulations that OSHA set in 1994, would have applied to asbestos paper gaskets too, correct?
A. They would.
Q. So it's just -- OSHA didn't have -- there was no data in the published peer-reviewed literature when they proposed the rule, and they were taking precautions with respect to any gasket you might come into contact with, correct?
A. I would not say that's entirely correct. You're correct about the peer-review published literature, but that's not what OSHA predominantly relies on in their rule-making record. They rely on data, predominantly, such as we were discussing earlier, things submitted by industrial hygienists and industry like the Shell study, or like the Industrial Hygiene Foundation study at Garlock that's been done by industrial hygienists specifically to evaluate workplace hazards.
Q. Do you know if anybody submitted either of those documents to OSHA?
A. That I don't know one way or the other. I would have to

go to Washington and look at the OSHA rule-making docket.
Q. You don't know of any data that OSHA considered when they were passing the rule, correct?
A. Specific data, no.
Q. And you understand their charge is to err on the side of overprotection, correct?
A. I would not express it in that fashion. In fact, they have tried to do that in the past, and have been struck down by the courts. So as of 1990, '91, there were limitations on them as to what they could and could not do.
Q. You don't recall the quote from the U.S. Supreme Court where they said that OSHA has to make decisions on the frontiers of science, erring on the side of overprotection rather than under protection?
A. The frontiers of science part I do remember. But we also had a rather limited view of what they could and couldn't do. And I think they were held to a standard of excess risk of one death per thousand.
Q. I understand, but do you -- are you testifying that OSHA is not charged with erring on the side of overprotection?
A. Again, I'm not -- I would say that that is perhaps something that they've been charged with, and that they have attempted to do, but they have not been able to do successfully.
Q. I want to ask you about Mr. Henshaw's exposure

assessment. You had a chance to review it, correct?
A. Yes, sir, I did.
Q. Do you understand that there is a methodology for conducting exposure assessments, correct?
A. Yes.
Q. Even retrospectively, correct?
A. A fairly recent development, but yes, such exists at this point.
Q. You, yourself, have done a retrospective exposure assessment for individuals that work with asbestos products, correct?
A. I believe on two occasions, that's correct.
Q. Did you read Dr. Brodkin's testimony in the case about retrospective exposure assessments?
A. I haven't had a chance to do that, no, sir. But it looks like I'm going to get it.
Q. Well, I'm just showing you that he recognized it's appropriate.

"In scientific research into asbestos disease, researchers have, however, looked at various groups of workers and considered them collectively for making decisions?

"Certainly.

"And in that context, especially, retrospective dose reconstruction is quite helpful; is that correct?

"I would agree with that."

You don't disagree with Dr. Brodkin, do you?
A. In the sense of what she's talking about, no, I don't.
Q. And AIHA, the organization to which you're a member, speaks about similar exposure groups and the exposure assessment process, breaking working workers down into similar exposure groups, correct?
A. The document does that, yes.
Q. And then to look at the different groups exposure profiles historically, correct?
A. Yes.
Q. You looked over at Mr. Henshaw's exposure groups and said that nothing leapt out at you as being incorrect in the way he broke down similar exposure groups; is that correct?
A. Yes, it is.
Q. You were here for Mr. Shoemaker's testimony yesterday?
A. I was.
Q. He confirmed what he had said in his deposition that he would expect a pipefitter to work 250 -- or to replace 250, 300 gaskets a year, do you recall that?
A. Yes, sir, I do.
Q. You recall his deposition where he said the same thing, correct?
A. I didn't read his deposition, but I was here for his testimony, you're correct.
Q. All right. And 250, 300 gaskets a day (sic) in terms of

working days, that's about a little over one gasket a day, correct, or right at or a little above?

THE COURT: Not 250 a day, 250 a year.

MR. HARRIS: Sorry, Your Honor.

Q. Two hundred fifty a year or 300 a year. That's -- if there's 250 days, working days in the year, that's about one gasket a day, correct?

A. Yes, sir.

Q. In response to Mr. Boelter's letter, the OSHA individual that responded suggested that Mr. Boelter, assuming eight gaskets a day, was certainly reasonable. But it was also reasonable to assume that a pipefitter or someone would replace 10 gaskets a day, correct?

A. In a single day, yes.

Q. So in order to -- in order to respond to Mr. Boelter's letter on the exposure estimate that he had done with respect to the OSHA warning label, he had to assume about 10 times more than what Mr. Shoemaker would say would be the typical number of gaskets in a day -- typical number of gaskets a day that a pipefitter would work with, correct?

A. No. That's not quite accurate, sir. Mr. Shoemaker wasn't asked anything about addressing, that I could see, at least during the course of the day yesterday, what the maximum number of gaskets one could realistically expect a person to work with in the course of any given day. He was simply asked

in the course of a year, how many a person would typically change out. And of course over the span of a year, what that worked out to is in his testimony, 250 to 300. Which if you just look at that on a per day basis, as you say would work out to one a day. That doesn't mean that on a given day, an individual might not work with many more gaskets than that.

Q. Okay. You're not aware of any evidence that people are working with 10 gaskets or replacing 10 gaskets a day, correct?

A. I'm not sure what you are referring to when you mean evidence. If you're talking about some of the things that I read and considered over the years, yes, I see people testify to that.

Q. Okay. But what Mr. Shoemaker was talking about was not 250 to 300 asbestos gaskets a year, he was talking about all gaskets, rubber gaskets, spiral wound gaskets, correct?

A. I think he estimated what, that half of them would have been asbestos gaskets. But you're correct in your overall statement. He was not talking exclusively about asbestos gaskets.

Q. You mentioned Mr. Boelter removing -- the picture on the AIHA journal of Mr. Boelter removing a gasket. The standard for whether asbestos controls apply under the '94 regulation that you cited, is that the gasket has to be visibly deteriorated and cannot be removed intact; is that correct?

A. That's the conditions under which all those restrictions that we discussed about gasket removal is class two work, occur, yes.
Q. And you also understand though, if you have a negative exposure assessment with the type of work that you're doing, you don't have to follow those -- take those steps that are set out in that '94 regulation you're referencing, correct?
A. Well, I think the court needs to understand that there are an awful lot of steps, and a lot required in order for one to establish a negative exposure assessment under OSHA's regulations.

But yes, with that understood, if you do really have a proper negative exposure assessment, then that could be done.
Q. So you're not here to say that Mr. Boelter was violating OSHA in connection with the work that he was doing that was photographed and put on the journal, are you?
A. Purportedly he was doing that work to determine whether there were or were not problematic exposures arising from gaskets. So not knowing whether there were or were not, yes, he would have been in violation of OSHA in performing the work in that manner.
Q. But you're not saying that he didn't already have a negative exposure assessment before he did this study -- this was his first study in that regard, are you? You don't know that?

A. I've not seen any data from Mr. Boelter that supports the proposition that he had a negative exposure assessment.
Q. You mention in your report about whether chrysotile's a cause of mesothelioma. We went over that and I just want to be clear. You're not an expert on the epidemiology of chrysotile, correct?
A. I would agree with that.
Q. In fact, I asked at your deposition, you cited or made some statements about epidemiology in your report, but I asked you at your deposition, you were not able to provide us a definition of what a statistically significant epidemiologic study was, right?
A. Correct.
MR. HARRIS: Thank you, Mr. Templin.
THE WITNESS: You're welcome, sir.
THE COURT: Anything else, Mr. Frost?
MR. FROST: Just very briefly, Your Honor.

REDIRECT EXAMINATION

BY MR. FROST:
Q. Mr. Templin, I know you weren't here for Mr. Boelter's examination, but if Mr. Boelter testified that prior to doing his study that he didn't know the results of that study, would he then have been in violation of OSHA?
A. Doing the work in the manner depicted on the cover, yes, he would have been.

Q. Now, you were asked some questions about Dr. Brodkin's testimony and exposure assessments, you remember that, correct?
A. Yes, I do.
Q. And that was limited to exposure assessments of groups in epidemiological studies; is that your understanding?
A. Yes, sir, it is.
Q. And because you were drawing a distinction, I want to make sure it's clear, and the record is clear. Is there a difference between doing exposure assessments in an epidemiological study where you have large groups of people and you're trying to figure out who was highly exposed or not, versus doing an exposure reconstruction, or exposure assessment in an individual case. Is there a difference?
A. There certainly is.
Q. And can you tell us the difference and what your opinions are concerning that?
A. Certainly. The exposure reconstruction exercise with respect to big groups, allows one to say that they are either exposed to a lot of asbestos, a moderate amount, low amount, et cetera. And then based on the findings from those various groups, say that these large groups of people collectively are at varying levels of risk, of incurring asbestos-related disease.
Now when one attempts to do that for an individual, very

often -- more often than not, certainly, number one, you don't have all the information necessary to do it.

In other words you have only a very broad range of potential exposures occur. You don't know, often, how frequently the person did the operation, or the duration per operation.

So those are really the three elements that would go into trying to reconstruct an individual's exposure.

Often we have very nebulous data about one aspect, and insufficient data on the others. And no matter what number you come up with, that really doesn't allow you to predict what the individual's risk is.

Clearly if we're talking about somebody who already has a disease, their risk at some point in time became 100 percent.

Q. Now you were also asked some questions about amosite insulation. Have you looked at whether -- you know, throughout this trial I've heard people talk about insulation and insulation, insulation, it's all amosite. Is that -- in the real world, is all thermal insulation amosite-containing?

A. No, sir, it isn't.

Q. And what have you reviewed and what have you found concerning the different types of asbestos in thermal insulation?

A. I've reviewed responses to interrogatories from some of the major manufacturers, such as Johns-Manville, and I have

either personally collected or at least reviewed the analytical results of thousands of samples taken of thermal insulation. Predominantly they are either chrysotile only, or a combination of chrysotile and amosite.

Q. And in fact, has the fact that thermal insulation that insulators use, the fact that it was predominantly chrysotile, has that been published in peer-reviewed articles?

A. Yes, it has.

Q. Now you were asked some questions about gaskets and packing, and your knowledge about the danger of gaskets and packing in the literature. You didn't do a comprehensive review of the literature concerning gaskets and packing prior to the 1960s. You just talked about the Merewether and Price, correct?

A. Yes, sir, as we discussed.

Q. And in fact, an individual like Dr. Brodkin or maybe Dr. Welch might be individuals better qualified to talk about what was known in the medical and scientific literature concerning gaskets and packing from the 1930s to the '60s?

A. Yes, sir, they may well be.

Q. And even your knowledge, gaskets and packings in Merewether and Price, they were talking about gaskets and packings in the context of asbestos-related disease?

A. Yes, they were.

Q. And then you were asked about Tyndall lighting, and I

don't want to belabor the point. But Dr. Longo didn't make up Tyndall lighting and those methods, right?
A. No. That came way, way before Dr. Longo was ever thought of.
Q. And EPA, that's the standard method used by the EPA even today?
A. Correct.
Q. And companies like Union Carbide and others have recommended in their documents that you use Tyndall lighting?
A. That's also correct.
Q. You were asked some questions about the Garlock documents that you and I went through that we provided those to you -- that you were provided those in litigation.
Are you aware, if I went to the library say here in Charlotte or wherever, and I tried to look for the Asbestos Textile Institute Meetings, I couldn't find those in the local library, could I?
A. It would surprise me greatly if you could.
Q. And in fact, this IHF study that you were asked questions about, and you were asked whether you knew it was a spiral-wound gasket or if it was a sheet gasket, are you aware whether Garlock even made spiral-wound gaskets?
A. Not to my knowledge.
Q. What we do know about this is, is that this test, whatever gasket they're using, it was done for Garlock,

correct?
A. At their main manufacturing facility, yes, sir.
Q. So no matter what type of gasket is being tested here, we know it's a Garlock gasket?
A. Well, one would hope that they're using their own gaskets in their own manufacturing setting, yes.
Q. Then you were asked some questions, you know, about all these things, what was known. One of the other things that we know, and this ACC 1074, that Garlock actually in its manufacturing, had in 1949, a workman's comp claim filed against it for asbestosis. You're aware of that, correct, sir?
A. I think that's dated '45. Yes, that's correct.
Q. That's ACC 1074, which I don't think we referred to in the beginning. What we do know is that in the 1930s and '40s, at least in the manufacturing of these types of materials in the textile industry, and particularly Garlock in 1945, there are claims being made for asbestos-related diseases?
A. That's correct.
MR. FROST: Thank you, sir.
THE WITNESS: You're welcome.
THE COURT: Thank you. You can step down.
Thank you, Mr. Templin.
THE WITNESS: Thank you, Your Honor.
MR. FROST: And Your Honor, we would offer ACC 1074

at this time. I believe I neglected to offer that before.

THE COURT: All right. Admit that.

(ACC's Exhibit No. 1074 was received into evidence.)

MR. HARRIS: Your Honor, may I follow-up with just a quick question?

THE COURT: Yes.

Before you get too far, Mr. Templin.

THE WITNESS: Sounds like I better come back to the microphone.

CROSS EXAMINATION

BY MR. HARRIS:

Q. Mr. Templin, do you have an understanding in the research or in the documents that have been provided to you by Waters and Kraus, that Johns-Manville insulations almost exclusively used amosite in the 1950s and the early 1960s?

A. In looking at their responses to interrogatories, no, I would not agree with that.

Q. Okay. You mentioned the workers' compensation claim by Vera Clemons. She worked in Garlock's textile plant; is that correct? Is that your understanding?

A. Yes, sir.

Q. She worked -- she started working at Garlock's textile plant in 1918, correct?

A. Yes.

Q. So from 1918, there were not a lot of controls or -- let

me ask this way:

You had mentioned Merewether and Price being a landmark study or an important study in the development of the knowledge of potential hazards of asbestos, correct?

A. I did.

Q. That was in the -- there's a '32 or 1930, '31, '32, '33 report or reports, correct?

A. Series of reports beginning as far as I'm aware 1930.

Q. And so the practice wasn't before then, certainly not in the 19 teens and the early 1920s for there to be a lot of controls with respect to asbestos exposures, correct?

A. I can't say what the practice was. I mean, certainly there was nothing to have prevented somebody from --

Q. No --

A. -- implementing those. But whether or not that was the practice, I couldn't say.

Q. There were efforts to control dust, but asbestosis wasn't -- was it even recognized as an official disease before 1927?

A. As far as I'm aware, no.

Q. Okay. So the special significance of exposure to asbestos dust, as opposed to dust generally, wasn't fully appreciated in industry in the 1910s and the early 1920s, correct?

A. As far as I'm aware, that's correct.

Q. Okay. You spoke about the Navy study, and I was looking over your testimony from the MacDonald case. You had said that the Navy study shows that people can remove gaskets safely; correct? Is that what you recall?
A. As I said, that was 11 years ago. I don't recall my testimony verbatim.
Q. Is that what you understand, though, from the results of the Navy study, is that workers could remove gaskets safely?
A. Provided sufficient precautions are taken, yes.
MR. HARRIS: Thank you.
THE WITNESS: You're welcome.
THE COURT: I think you can step down now. Thank you.
All right.
MR. GEORGE: Your Honor, at this time we would call Dr. Arnold Brody.
THE COURT: Okay. Looks like we're going to have a -- going to have a -- what do they call it in hockey when they bring in a new bunch, a new shift?
MR. SCHACHTER: A line change.
THE COURT: Line change.
MR. FROST: Just shortly, Your Honor. You'll be stuck with me for the afternoon.
THE COURT: Okay.

ARNOLD R. BRODY,

Being first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. GEORGE:

Q. Can you please introduce yourself to the court?

A. Yes, sure. My name is Arnold R. Brody. B-R-O-D-Y.

Q. And Dr. Brody, can you please tell the court what you do?

A. I'm a basic scientist. I'm a research scientist. I've been studying lung diseases since the end of my Ph.D in the early '70s. Focusing on asbestos disease since the middle '70s.

Q. And I've heard you described as a cell biologist, is that an accurate description of what your expertise is?

A. Right. So my Ph.D is in cell biology. Every living thing is made of cells. We need to understand how cells function. Every disease has a target cell from which that disease develops. I've been focusing on lung cells and lung diseases for quite sometime.

Q. Do you consider yourself to be an epidemiologist?

A. Not at all.

Q. Are you a medical doctor?

A. No, I'm a Ph.D.

Q. Have you had the opportunity in your career to teach medical students?

A. Regularly, I did that, sure. I was a full professor at the Tulane University Medical School in New Orleans. I was

the vice chairman of the pathology department there for many years, and taught regularly in the medical school, medical students, graduate students and physicians as well.

Q. Do you consider yourself to be a pathologist?

A. Not -- I mean, really. A pathologist is an MD who typically works at a hospital or a clinic. But there is a category called experimental pathologist. And we -- pathology is the study of disease. So experimental pathologists like myself, do experiments to understand the disease process.

Q. So in effect, you're going the opposite direction. Epidemiology is a study of broad-based populations, and you're going the opposite direction down to the cellular level, right?

A. Sure. I wouldn't characterize it as opposite, because in fact what we do is a very important component of epidemiology. But sure, it's sort of the other end of the spectrum of the science of causation, for example.

MR. GEORGE: Your Honor, may I approach?

THE COURT: Yes.

Q. Dr. Brody, I'll hand you your CV. I just want you to take a look at that and make sure that's an accurate copy of your curriculum vitae.

A. Yes, it's fine.

Q. Can you briefly give the court an understanding of your educational background?

A. Yes. I did a Bachelor of Science degree at Colorado State University in zoology, that's the study of animals. Then I went to the University of Illinois where I received a Master of Science degree in anatomy, that was animal anatomy, human anatomy. That's where we learn how all of our parts fit together, how they function, muscles, bones, nerves, that sort of thing. Then I went back to Colorado to do a doctorate Ph.D in cell biology as we discussed. Then I did three years of post-doctoral study at Ohio State University, then started my academic career.

Q. During the course of your academic career, how many papers have you published over the years concerning asbestos, and how asbestos affects your body in the peer-reviewed medical literature?

A. I have 153 peer-reviewed papers, 55 book chapters. So of the -- and proceedings. So of the 153 peer-reviewed papers, about 130 of them or so relate directly to asbestos. The others deal with different lung diseases I've published in asthma, viral diseases, and basic lung cell biology, that's 153 papers. Of the 55 chapters, those are invited reviews, and those almost -- I think every one of them deal directly with asbestos disease.

Q. I think you told the court earlier that you taught medical students on occasion. Do you give seminars and presentations to other types of groups?

A. Many times.
Q. How often are you asked to give presentations about asbestos?
A. Well, during the heart of my career I would be asked at various universities around the country and around the world, probably every month or so, to go somewhere and deliver a lecture.
Q. Have you ever had the occasion to talk to any governmental regulatory agencies?
A. I have. I've talked to NIOSH and OSHA. I guess we know what those stand for, right. And I've been Congressional subcommittee. I've given my testimony regarding sources of funding and where funding should go, that sort of thing.
Q. Speaking of funding, has any of your research been funded by the federal government?
A. Well, it all has. I mean through this very competitive process where the National Institutes of Health provides funds. About 10 percent of all the applications that go in are funded. So it's a very competitive process. And my work was funded, without interruption, throughout my career.
Q. And have you done hands-on research concerning the different types of asbestos, including amosite, crocidolite, and chrysotile, to determine how those different types of asbestos affect the animals and how they show an effect on humans?

A. Exactly, yes, sir.
Q. Can we agree that any opinions you offer today will be offered within a reasonable degree of medical certainty?
A. Yes.
MR. GEORGE: And Your Honor, at this point we would offer Dr. Brody as an expert in cell biology and experimental pathology.
MR. SCHACHTER: No objection.
THE COURT: All right. He will be so accepted.
BY MR. GEORGE:
Q. Now, Dr. Brody, have you prepared a slide show to assist the court to understand how asbestos can cause disease?
A. Well, I have a series of slides that I have used when I teach in medical school. And I have a series of slides that I use when I lecture in various places around the world. And some subset of those I used in court a number of times, sure.
Q. And before we get to that, I want to address very quickly your experience in the asbestos litigation.
How often do you testify in deposition or trial in a case regarding an allegation that somebody has contracted an asbestos disease?
A. So in 1989 I had one case. That was the first case I testified in. And then through the early '90s it was probably a few cases a year. In the last 10 years it's been probably close to one or two trials a month, and the same number of

depositions.
Q. And on whose behalf do you typically testify?
A. Typically for plaintiffs.
Q. Have there been any occasions where you've been requested by a company that made or sold asbestos-containing products to testify on their behalf in different types of proceedings?
A. Yes, about 10 different companies over the years.
Q. What kind of proceedings have you testified on behalf of the companies?
A. Well, these were insurance recovery cases where the companies were asking me to give the exact same testimony that you've asked me to give here today.
Q. And have you participated in any prior bankruptcy proceedings?
A. I have, yes.
Q. And how many?
A. Two, that I recall.
Q. How much do you charge an hour?
A. $550 per hour.
Q. Do you have an estimate of how many hours you've spent in preparing for this particular case?
A. Well, I think deposition was three or four hours, something like that. I wrote a report, probably a couple hours there.
Q. You wrote two reports, correct, a report and a rebuttal

report?
A. Yes.
Q. And your report is ACC 3563, and your rebuttal report is ACC 3564.
MR. GEORGE: May I approach, Your Honor?
THE COURT: Yes.
BY MR. GEORGE:
Q. Let me just ask you if these are accurate copies of what you've prepared in this case?
A. Yes. You gave me two copies of the rebuttal, and also my expert, yes. Fine.
Q. Okay. Does your testimony -- is it influenced in any manner by whom asks you to give it?
A. No. As I say, I mean, every time I've ever testified, I explain how asbestos causes disease, and whether it's for a company or -- where as I typically do for the plaintiffs, that's my testimony. It's based on the work I've done over the decades.
Q. Now, we're talking about causation. You're familiar, are you not, with Sir Austin Bradford Hill's speech on the environment and disease association or causation that he gave in January of 1965?
MR. SCHACHTER: Objection, Your Honor. This is in the area of epidemiology. He's not qualified in that area. I think he'll admit that.

MR. GEORGE: That's how far we're going with that.

THE COURT: Overruled.

BY MR. GEORGE:

Q. You're familiar with this?

A. Yes.

Q. Now you would agree with me that Sir Bradford Hill listed out nine different considerations that scientists should use in determining cause and effect?

A. That's what he called them, yes.

Q. And epidemiology would apply to the first criteria, correct, strength of association?

A. Sure.

Q. How many of the other considerations are applicable to your type of research?

A. Well, several of them. First of all, consistency. In other words, you need to find the same results when you carry out your experiments.

Certainly the biological gradient plausibility, those are both essential components. Where it says down at the bottom, "experiment", that's extremely important. I mean, any of them could be applied to the kinds of experiments I do to provide the overall issues of plausibility and how the diseases actually develop.

Q. And in this paper, did Sir Austin Bradford Hill give some guidance on how to apply these nine considerations?

A. He did.
Q. He said that "here are nine different viewpoints from all of which we should study association before we cry causation. What I do not believe, and this has been suggested, is that we can usually lay down some hard and fast rules of evidence that must be obeyed before we can accept cause and effect. None of my nine viewpoints can bring indisputable evidence for or against the cause and effect hypothesis, and none can be required as a *sine qua non*." What does he mean by this?
A. Well, what he means is, you can't take any one of those and draw the causation. You have to be able to apply at least several of the categories.
Q. Now has your experimentation been designed to answer conclusively the question of cause and effect of asbestos or chrysotile exposure and the development of mesothelioma?
A. No.
Q. Does your experiments -- do they add to evidence of what scientists could use in making such a determination?
A. Yeah, exactly. If you went back to the list, we could point how the experiments do that. We don't probably need to.
Q. Very quickly.
A. Yeah.
Q. Does your experiments -- tell me about biological gradient. What do your experiments tell us about whether there's a dose response relationship?

A. Well, it's very clear there's a dose response relationship in animals and people. The more people or animals are exposed to, the more likely they are to get the disease, the more rapidly they get a disease.
Q. How about biological plausibility? Does your experiments add anything to the standing literature on whether it's biologically plausible that exposure to any of the different fiber types can cause mesothelioma?
A. Yeah, certainly. There are a number of different ways.
Q. Have you -- does your PowerPoint help explain that?
A. Yes.
Q. Okay. Let's start. I'm going to give you the PowerPoint --
A. Okay.
Q. -- the control.
A. You want me to sit here?
Q. You want to come down here? Whichever is more comfortable for you.
THE COURT: Go ahead. Wherever you are comfortable is fine.
THE WITNESS: Okay.
MR. GEORGE: You need a mike. She has a little roving mike for you.
THE WITNESS: Does this click on?
Does that work?

MR. GEORGE: Over in the corner so the court reporter can see you.

Q. Let me ask you first, what is this a picture of?

A. Okay. Well, this is a picture of what's called an electron microscope. That's the kind of microscope that I used for many decades to magnify things tens of thousands of times. Because we can't really see asbestos fibers with the naked eye, and sometimes with many different kinds of microscopes. So we need what's called a scanning electron microscope.

And I can take a piece of tissue as small as a period at the end of a sentence or as big as this device I have in my hand, put that tissue into this door right in front of me, and that enters it into a vacuum.

And at the top of the chamber there's an electron gun that sends electrons down through the vacuum where it strikes the sample. The electrons then raster across the sample, actually make an image of whatever it is that I put in there, and the electrons can then be collected and magnified. Then that appears on the screen in front of me.

Just off the screen is a camera so I can take a permanent image of whatever it is I'm looking at, for example, asbestos. This is what asbestos looks like under the electron microscope. So we can see all of the individual fiber sizes and shapes.

This is a one micron bar. So we can see how big and small the fibers actually are. One micron is one-thousandth of one millimeter. So it's easy to see one micron when it's magnified 4,300 times as you can see here. So if you want to know how big or small these fibers are, you take this little marker, put it up against the fibers. You can see this one's about one micron across. But then it splits and splits again. And that's the nature of chrysotile asbestos. It's constantly fracturing and breaking down into smaller and smaller fibers.

Q. This is a fiber bundle. Do fiber bundles typically like this picture shows -- have different sizes incorporated into it?

A. Oh, sure. So, for example, I mean if this bundle were kind of floating by and the light were just right or using Tyndall lighting, you would see it as a speck of dust.

But within the fibers you could -- within the bundle, you could have -- you could have bundles like this stuck together hundreds of times, or you could have individual fibers from the bundle.

Q. Now you say that those fibers have a tendency to split? Do they fracture longitudinally or do they fracture laterally or both?

A. Both. And you can actually see -- you can see the longitudinal splitting going on right here. You can see some short straight fibers here that have fractured length-wise as

well.
Q. Is that a property that is more attune to chrysotile than the amphibole type of asbestos?
A. Yes, it is.
Q. What effect does it have when a chrysotile fiber gets thinner because it fractures longitudinally?
A. Well, that makes it more easily transportable, translocating around the lung. So I'm going to show you in a second where the fibers land in the lung, and then because they get small like that, because they fracture, they can then be transported in what's called the fluid flow of the lung.
Q. Before we get to where they're going, let me ask you this. How are your animals being exposed?
A. So they're in what are called "exposure chambers", they're about six feet high, four feet wide. There are cages are placed inside the chambers. The asbestos generator at the top of the chamber makes a high concentration of dust, so that the animals inhale the dust for however long I prescribe the exposure.
Q. What level of asbestos are you pumping into their cages?
A. Well, it's a high concentration. It's about 1,000 fibers per cc. It's what miners and millers and insulators experienced in the early years of their job categories.
Q. Why do you use that much asbestos?
A. Well the animals are short lived, and in order to produce

a disease, we have to expose them to high concentrations. The animals only live two to three years. So if you want to produce a mesothelioma or a lung cancer, you have to essentially expose them through their lifetime. And then at the end of the exposure time, the end of their lifetime, you'll have a small percentage of the animals developing tumors, just like people, small percentage.

But we've done it another way which is to look at the animals very quickly after exposure, and look at the early events that lead to the disease.

Q. So you're trying to document what happens when these animals inhale the fibers and they get into their bodies?

A. That's right. And so we went from that to the first years of exposures, then we went to longer times, months, and then finally we went to years and produced tumors.

Q. Is it your objective to induce mesothelioma?

A. No.

Q. Why not?

A. Well, first of all that's already been done in a number of different settings. A number of scientists have exposed animals, as I say, through their lifetime, produced the tumors. We know that can be done, the question is, how does the asbestos do it. That's what my work involves.

Q. Would it be practical for you to use a level of like 0.1 fibers per cc and see what it does to animals?

A. No. That would not produce tumors in the short-lived animals. The closest that was done to that was .79 fibers per cc, and that produced some lung injury, but it would not be expected to produce tumors in the animal models.

Q. Do you intend for your research to simulate human low level exposure to asbestos?

A. No. That was never our design. And as I said, that's not the way you learn how these agents act. Whenever you use -- whenever scientists use carcinogens, they use them at levels that they know are going to produce the changes that you want to study. Then also when we use the animals, we have to be sure that we're asking questions that can be answered and that are telling us about human disease.

Q. What did you find when you used these levels of exposure? Where did these fibers go in the animals and what do they do with the animals' bodies?

A. Yeah. Well, for example, this is the lung of a rat. You can see the end of the airway where it opens out into the gas exchange area. There are hundreds and millions of spots like this around the lung. These are called alveoli or individual air spaces. You can see in the walls of the air spaces that when I opened it up, the little holes in the walls where the blood runs -- all the blood in our bodies has to run through our air spaces.

And this is from an animal that was exposed to asbestos,

chrysotile asbestos for a single hour. And I've done these experiments with crocidolite and amosite as well.

What I'm going to do is focus the microscope on this spot right here, and we'll look at this surface of the air space.

Q. Why do you use this particular animal?

A. Well, rats and mice we use typically, but these kinds of things are done with guinea pigs and other animals. And whatever animal we're talking about, they're similar structures. These are exactly -- these structures that I'm showing you here, are the same in you and me and dogs and cats and giraffes. They're really all the same with the same functions.

So as I say, if we look at this spot immediately after a single hour of exposure, we're looking right down on the surface of the air space. So, let me orient you. This black hole right here, is this black hole right here. And so if we're looking on the surface then, we can see -- and if we think about this -- actually, if we think about this surface, it's kind of like this carpet that we're standing on here, and the fibers have landed on the carpet. And if you think about this courtroom as an air space, and there's asbestos floating onto the carpet, we're going to look down at that carpet and answer your question, where does the asbestos go.

Well, first of all, it lands on the carpet, lands on the surface. These are individual cells, they're called

epithelial cells. And this is where oxygen carbon dioxide moves. And you can see a long curly chrysotile fiber. You can see some short chrysotile fibers. This is a 10-micron bar, so that means this fiber is about 10-microns long. So there's a wide array of shapes and sizes just like we saw when we looked at that bundle.

Now, the striking thing that we found, was that some of these fibers actually get taken up by the carpet cells and pushed on to the carpet. So no one had ever observed this before, and this suggested that some proportion of the fibers then had access to the fluid flow of the lung.

Q. And what's the significance of that?

A. The fluid flow of the lung goes to the pleura. And the target cell for mesothelioma are the mesothelial cells that line the outside of the lung. And if you can get the fibers there, then you have the carcinogen at the target site.

Q. Now of the different fiber types, we talk about amosite and chrysotile, which are the ones that are more likely to remain under the carpet as opposed to ones that will get into the fluid of the lung?

A. Yeah. So crocidolite and amosite have a shorter -- I'm sorry -- have a longer half life, so they're more likely to stay in the lung. Chrysotile has a shorter half life in the lung, and so it's more likely than to be distributed to the periphery of the lung. And when investigators looked at the

pleural tissues and the lymph nodes, which are peripheral -- and we can talk about lymph in a second, if you want. But when they looked at those peripheral areas, there was more chrysotile, and that makes perfect sense because it's the chrysotile that's breaking down, smaller fibers, more likely to get into the flow.

Q. So what happens to the ones that are translocating?

A. Okay. So here's another experiment, another animal of, you know, numerous subjects that we use in each study. Here's just one picture from thousands of spots like this around the lung. But here's an air space, another air space, another one here, here's the carpet, epithelial cells. And you can see there's a small fiber bundle that's landed here. This is about 10-microns long.

These characters that look like doughnuts are what your red blood cells look like. Red blood cells look like doughnuts because they have a depression in the center, not a hole. And from this side to the red cell to this side is five microns across.

Now, this is the lung of a rat, but your red blood cells and mine, and dogs, cats, guinea pigs, giraffes and whales, all have the same size and shaped red blood cells.

And you can see where the red blood cells are moving through the capillaries, the small vessels. And you can see that this fiber is sort of on its way into the structure of

the fluid flow. And the fluid flow is twofold. One is blood, which is obvious. And you can see where the red blood cells are running. Wherever blood flows, there's a clear fluid called lymph, that flows around the blood flow.

You've probably heard of lymph nodes. Lymph nodes are small bundles of tissue that filter the lymph wherever it flows from head to toe.

So investigators looked at lymph nodes around the lung. For example, this is obviously a human lung. This is the trachea. These are the conducting airways. These green blobs around the lung are called lymph nodes.

Q. What's the purpose of the lymphatic system?

A. Well, it has two important functions. One is to help control pressure in the blood flow system, in the vascular system, because it flows around it. You can actually exchange fluids.

The other is that the lymph can carry -- does carry, cells of the immune system. And actually these lymph nodes, these green blobs that filter the lymph flow are part of our immune system. They are immune cells in the lymph nodes.

Now some investigators asked if asbestos was getting into the lymph nodes. Not only these lymph nodes around the lung, but the lymph nodes in the peritoneal cavity that holds the stomach and intestines. Those are called mesenteric lymph nodes. The investigators found increased numbers of asbestos,

typically chrysotile in the lymph nodes around the lung and in the peritoneal cavity. And the only way those fibers get there, is by this pathway of being inhaled, landing on the carpet, and a small percentage of those then get picked up and transported to the fluid flow, the lymph.

And you can actually see that in -- this is called a Netter diagram. This was Dr. Netter's given us atlases of the human body and health and disease.

And you can see this flow, you can see the pattern of lymph flow that Dr. Netter is demonstrating goes to the pleura. When you look at the surface of the pleura, you see this vorticular or network-like pattern, that's lymph flow. The lymph is flowing from the lung. It's a circulation. Some comes back in, some of the lymph is out in the pleural cavity. When you take a breath, you don't feel your lungs rub against your chest wall because there's fluid there. Part of that is lymph. And that's from this lymph flow and asbestos fibers get into the lymph flow.

Q. So what does that tell us about the biological plausibility of asbestos to cause a tumor in the lining of the lung or the lining of the peritoneal?

A. Right. So the target cell for mesothelioma, are the cells of a singular layer of cells on the outside lining of the pleura. They're called mesothelial cells. If somebody has a cancer of the mesothelial cells, it's called

mesothelioma. So the answer to your question is, we know that the fibers get into the lymph that reaches the mesothelial surface, and the mesothelial cells, and therefore it's absolutely plausible that that's what's happening in people.

Q. Now have there been experiments to determine if the cells are -- if the fibers, when they get there, are capable of causing the type of problems that would ultimately result in a tumor?

A. Yes. There are a whole series of experiments that allow one to see what asbestos fibers do to cause genetic damage. That's the key to getting a cancer. You have to cause genetic damage.

Q. You have some slides that explain that?

A. Yes. And before that, if you would like -- I have a summary of this transport. Okay.

So I want to summarize this issue of transport to the pleura, and then I'll talk about how the fibers cause --

MR. GEORGE: That will probably be after lunch. So why don't we summarize on this and then we take our break.

THE WITNESS: You want me to finish this one?

THE COURT: Finish this and then we'll break.

THE WITNESS: Okay. All right. So what I'm going to do then is take a section out of lung here. And you'll see the pleura on the right. You'll see the lymph channels going to the pleura in another diagram. So we take this out, and

here you can see the pleura on the right. And here the artist is showing some asbestos fibers inhaled and floating down into the air spaces which I showed you actually happens in the animal model. And here you can see this fiber is -- a little bit of it sticking out, just like I took a picture of when I did this experiment, you can see there's a little bit of the fiber sticking out as it goes into the fluid flow, which is exactly what's happening here. You can see a bit of the fiber.

And then the artist says, lymphatic fiber transport to the pleura. And so that's this pathway then to the pleura. And here are the mesothelial cells. So now the fibers are at the mesothelial surface, can interact with the individual mesothelial cells to cause the genetic errors required for a cancer.

Q. And the -- one second on here. The different headings, the biphasic mixed, the fibrosarcomatous, epithelial, mesothelial, papillar, are those all different affects that happen in the pleura when a tumor is generated?

A. Well, those are different diagnoses. So in other words, a pathologist will look at the cells and say, well this is an epithelial or fibrosarcomatous or mixed. But the interactions that caused those tumors, are essentially the same.

MR. GEORGE: We'll pick up with that when we come back from lunch.

THE COURT: Come back at quarter to 2:00.

MR. GEORGE: Okay. Thank you, Your Honor.

(Lunch recess at 12:25 p.m.)

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UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF NORTH CAROLINA
CERTIFICATE OF REPORTER

I, Laura Andersen, Official Court Reporter, certify that the foregoing transcript is a true and correct transcript of the proceedings taken and transcribed by me.

Dated this the 30th day of July, 2013.

s/Laura Andersen
Laura Andersen, RMR
Official Court Reporter